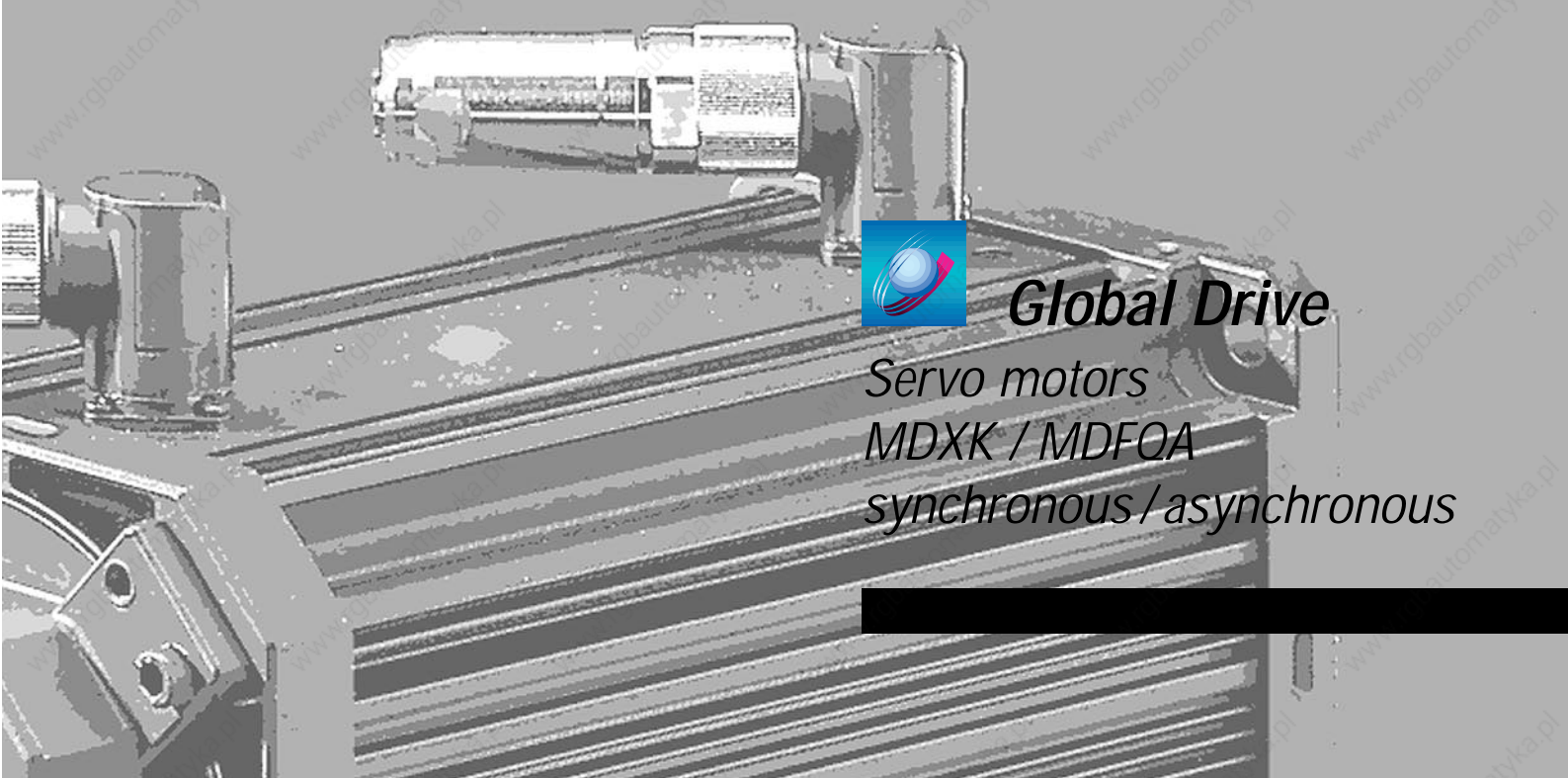
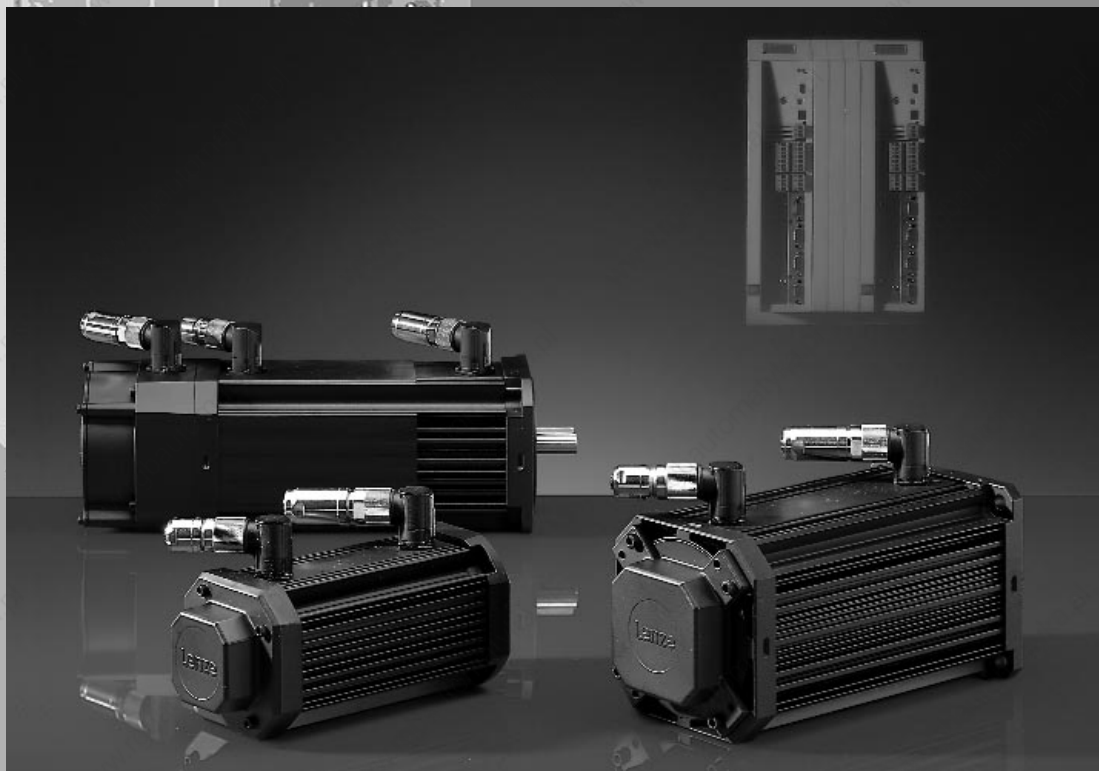


405 619

Lenze



Global Drive

Servo motors

MDXK / MDFOA

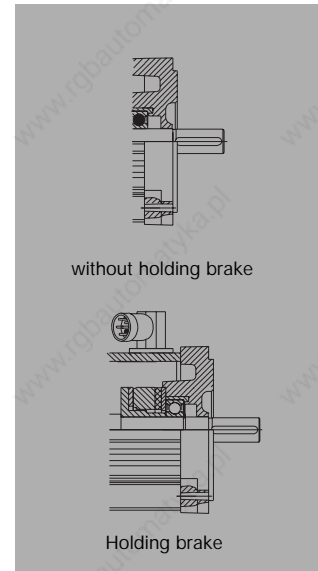
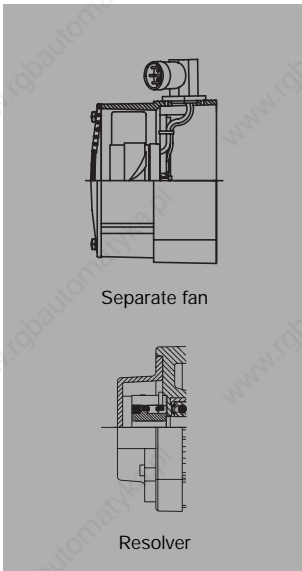
synchronous / asynchronous

System overview

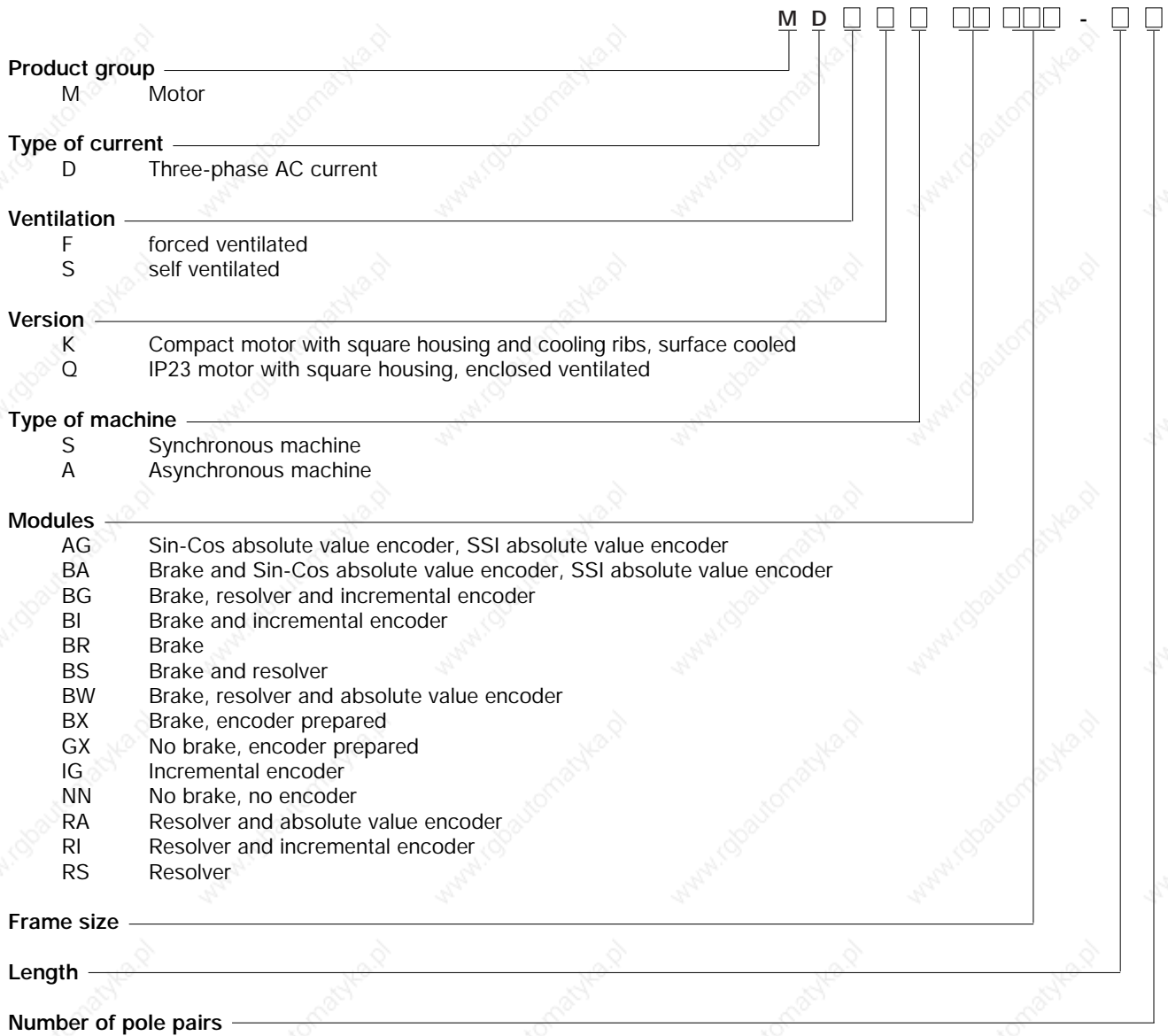
Servo motors

In the Global Drive System, asynchronous and synchronous motors perfectly match the controllers. Thanks to modular design and the planned options it is possible to select a suitable drive. Further assets of Global Drive servo motors are: small size, long life and high operational safety.

Comfortable system cables with plug-in connectors enable easy connection. Modern production processes ensure a good price / performance ratio. This catalogue describes all preference types which are available within 15 working days as well as all industry types which require a delivery time of 30 working days. We would like to present further options of this modular design personally.



Product code



Global Drive servo motors

Product information

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Application examples

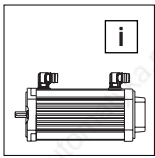
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Product information

Servo motors MDXK and MDFQA

Today, servo drive systems must fulfil highest demands. With Global Drive, Lenze succeeded in combining different drive components to form a perfectly matching system. The programme of servo motors for the power range up to 60.1 kW is completed by brushless synchronous servo motors for the lower power range from 0.25 to 4.2 kW. Compared with standard three-phase AC motors, these servo motors provide a very low moment of inertia, low weight, high maximum speed and a wide speed-setting range.

High dynamic response and accuracy

Servo motors provide a low moment of inertia and a high overloadability. Optimum temperature-independent control features are achieved by continuously measuring the temperature with an integrated temperature sensor. Together with servo inverters of series 9300, the motors ensure high speed accuracy, best concentricity and high angle acceleration.

Long service life

The high quality standard, Lenze sets for all components, meets the requirements of modern drive technology for operational safety and service life. A reinforced isolation with thermal reserve (coated wire to thermal class H, class F temperature rise) ensures a long service life of the winding. Prestressed rolling bearings with high temperature resistant lubrication ensure a long service life.

Operational safety

Enclosure IP54 of MDXK motors ensures good protection against dust and water ingress. MDFQA motors up to 60.1 kW are protected by enclosure IP23.

CE conformity

Of course, Lenze servo motors MDXK and MDFQA comply with the EC Directives:

- CE conformity to the Low Voltage Directive
- CE conformity to the Electromagnetic Compatibility of a typical drive configuration with inverter.

The electromagnetic compatibility can be easily guaranteed by using predetermined system cables.

No compromises with the output speed

The wide ratio range of gearboxes combined with the small ratio step of 1.12 enables the exact selection of the output speed range required.

Compact

The high power density of the motors facilitates small drive units.

Especially compact drives are formed by using geared servo motors with directly connected motors.

Adaptability

The modular motor design and the number of planned variants facilitate the selection of the motor for your application.

Thanks to the variety of output designs of motors and geared motors, the drives fulfil many application requirements:

- Servo motors with cylindrical shaft end with or without key
- Servo motors with flanges provided with through hole bores for mounting position B5, with threaded bores for mounting position B14.
- Geared servo motors with solid shaft, hollow shaft or hollow shaft with shrink disc.
- Geared servo motors with or without flange, foot or centring
- Different integrated angle encoders ensure the accuracy required:
 - Resolver as standard solution, optimised characteristic because of internal improvement of the resolver accuracy. SinCos absolute value encoder as industry type for highest accuracy. Incremental encoder with 2048 pulses as preference type for MDFQA and as industry type for MDXK.

Low noise

High chopper frequency of the inverters (up to 16 kHz) result in a low noise generation.

In addition, optimised tooth geometry and internally ribbed cast iron housings of Lenze Gearboxes reduce the noise generated.

Reduced backlash

The application of backlash-free permanent magnet holding brakes enables a defined holding of a position even when no voltage is applied.

Compared with other gearboxes, backlash-free connection elements of Lenze Gearboxes and the high splining quality achieved by precise production ensure a low backlash at the output of geared servo motors.

Special types

Special applications require special motor designs.

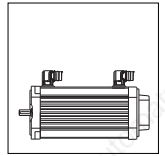
Possible options are e.g.:

- incremental encoder as feedback with 4096 pulses
- second feedback.

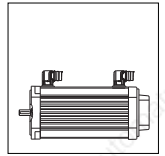
We are prepared to give more detailed information.

Selection

General data



| | Synchronous servo motors Series MDSKS, MDFKS | Asynchronous servo motors Series MDSKA, MDFKA | Asynchronous servo motors MDFQA |
|--|---|---|---|
| Enclosure | IP54 / IP65 | | IP23 |
| Thermal class (VDE 0530) | To thermal class F Insulation (coated wire) To thermal class H | | |
| UL-conformity | UL listed material for coated wire, brush leads, insulation material | | |
| Dielectric strength | Max. voltage amplitude $\dot{V} = 1.5 \text{ kV}$ Max. rate of voltage rise $du/dt = 5 \text{ kV}/\mu\text{s}$ | | |
| Vibrational severity | N | N frame sizes 056 and 071, R as of frame size 80 | N |
| Concentricity, eccentricity, coaxiality (DIN 42955) | N | N frame sizes 056 and 071, R as of frame size 80 | N |
| Mechanical tolerance | Diameter shaft end $d \text{ } \varnothing 11$ to $\varnothing 38$: k6, $d \text{ } \varnothing 55$: m6 Diameter centring flange $b 1$: J6 | | |
| Temperature monitoring (no complete protection) | Continuous temperature sensor (KTY 83-110) | | |
| Connection | 1 plug for each: Motor and brake Resolver and temperature sensor, separate fan (as of frame size 071) or terminal box | | Motor connection as terminal box, encoder connection with plug |
| Temperature range | -20 to + 40 °C without power derating (without brake, non-ventilated) -10 to + 40 °C without power derating (with brake) -15 to +40 °C without power derating (separately ventilated) | | |
| Surface temperature | Self ventilated motors (MDSK) up to 140 °C Forced ventilated motors (MDFK) up to 110 °C | | to 110 °C |
| Installation height | up to 1000 m a. m. s. l. without power derating | | |
| Demagnetising limit | > 4 · I _{rated} with self ventilation > 2,9 · I _{rated} with forced ventilation | Demagnetisation not possible | |
| Maximum torque | > 4 · M _{rated} with self ventilation > 2,9 · M _{rated} with forced ventilation | > 5 · M _{rated} | |
| Rated speed | 3000 min ⁻¹ | 1635-4160 min ⁻¹ | 550-2935 min ⁻¹ |
| Angle encoder | Resolver / Sin-Cos encoder | Resolver / incremental encoder / Sin-Cos absolute value encoder | |
| Mounting position | B5 / B14 | | B5 / B35 |
| Bearing | Deep groove ball bearing with high-temperature resistant grease, 2 seals | | |
| | Locating bearing at A-side | | at B-side |
| Shaft end | with / without key | | |
| Brake | with or without permanent magnet holding brake at A-side | | with and without spring- operated brake |
| Fan | Axial fan as of frame size 071 possible | | Radial fan |
| Colour | Black, RAL 9005 | | |



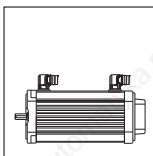
Synchronous servo motors series MDSKS / MDFKS (surface cooled)

| Motor type | Axial height h [mm] | Torque with 3000/min M _{rated 3000} [Nm] | Speed n _{rated} [min ⁻¹] | Torque M _{rated} [Nm] | Power P _{rated} [kW] | Voltage V _{rat. 3-} [V] | Current I _{rated} [A] | M ₀ [Nm] | I ₀ [A] | Maximum torque M _{max} [Nm] | Maximum power P _{max} [kW] | Frequency f _{rated} [Hz] | Inertia J [kgcm ²] | Weight m ¹⁾ [kg] | Gearbox connection corresp. to stand. motor d x l ³⁾ |
|-------------------|---------------------------|--|---|--------------------------------------|-------------------------------------|--|--------------------------------------|------------------------|-----------------------|--|---|---|--------------------------------------|-----------------------------------|--|
| without fan | | | | | | | | | | | | | | | |
| MDSKS 036-13, 200 | 35 | | 4000 | 0.6 | 0.25 | 245 | 0.9 | 0.65 | 0.9 | 3.1 | 5.4 | 200 | 0.22 | 1.5 | |
| MDSKS 036-23, 200 | 35 | | 4000 | 1.3 | 0.54 | 345 | 1.1 | 1.5 | 1.25 | 7.2 | 7.5 | 200 | 0.36 | 2.1 | |
| MDSKS 056-23, 190 | 51 | 2.9 | 3800 | 2.8 | 1.1 | 330 | 2.3 | 3.2 | 2.6 | 11.6 | 10 | 190 | 1.2 | 5.3 | 071, C105 |
| MDSKS 056-33, 200 | 51 | 4.3 | 4000 | 4.2 | 1.8 | 325 | 3.6 | 4.7 | 4.0 | 17.2 | 16 | 200 | 1.8 | 6.3 | 071, C105 |
| MDSKS 071-03, 170 | 65 | 5.9 | 3400 | 5.7 | 2.0 | 330 | 4.2 | 6.7 | 4.9 | 23.6 | 19 | 170 | 6.0 | 8.9 | 080, C160 |
| MDSKS 071-13, 185 | 65 | 8.8 | 3700 | 8.3 | 3.2 | 325 | 7.0 | 10.0 | 8.4 | 35.2 | 32 | 185 | 8.0 | 10.9 | 080, C160 |
| MDSKS 071-33, 180 | 65 | 12.7 | 3600 | 12.3 | 4.6 | 325 | 10.0 | 14.7 | 11.9 | 52.0 | 45 | 180 | 10.0 | 13.0 | 080, C160 |
| with separate fan | | | | | | | | | | | | | | | |
| MDFKS 071-03, 165 | 65 | 7.7 | 3300 | 7.5 | 2.6 | 330 | 5.6 | 8.8 | 6.6 | 23.6 | 19 | 165 | 6.0 | 10.2 | 080, C160 |
| MDFKS 071-13, 180 | 65 | 11.7 | 3600 | 11.0 | 4.1 | 325 | 9.2 | 13.3 | 11.1 | 35.2 | 32 | 180 | 8.0 | 12.2 | 080, C160 |
| MDFKS 071-33, 175 | 65 | 17.0 | 3500 | 16.2 | 5.9 | 325 | 13.1 | 19.3 | 15.6 | 52.0 | 45 | 175 | 10.0 | 14.3 | 080, C160 |

1) without fan, with resolver

3) frame size and flange of a standard motor with similar flange and shaft dimensions

6) magnetic / mechanical permissible torque



Selection

Rated data

Asynchronous servo motors series MDSKA / MDFKA (surface ventilated)

| Motor type | h [mm] | n _{rated} [min ⁻¹] | M _{rated} [Nm] | P _{rated} ⁵⁾ [kW] | V _{rated} ³⁾ [V] | I _{rated} [A] | M ₀ [Nm] | I ₀ [A] | M _{max} ⁶⁾ [Nm] | n _{rated max} [min ⁻¹] | f _{rated} [Hz] | cosφ _N | J ¹⁾ [kgcm ²] | m ¹⁾ [kg] | Gearbox connection corresponds to standard motor ³⁾ |
|-------------------|--------|---|-------------------------|---------------------------------------|--------------------------------------|------------------------|---------------------|--------------------|-------------------------------------|---|-------------------------|-------------------|--------------------------------------|----------------------|--|
| self cooled | | | | | | | | | | | | | | | |
| MDSKA 056-22, 140 | 51 | 3950 | 2.0 | 0.8 | 390 | 2.4 | 2.3 | 2.55 | 10 | 8000 | 140 | 0.70 | 2.4 | 6.4 | 071, C105 |
| MDSKA 071-22, 140 | 65 | 4050 | 4.0 | 1.7 | 390 | 4.4 | 4.6 | 4.6 | 32 | 8000 | 140 | 0.76 | 8.3 | 10.4 | 080, C160 |
| MDSKA 080-22, 70 | 71 | 2000 | 6.7 | 1.4 | 390 | 3.3 | 8.0 | 3.85 | 60 | 8000 | 70 | 0.75 | 19.2 | 15.1 | 090, C160 |
| MDSKA 080-22, 140 | | 4100 | 5.4 | 2.3 | 390 | 5.8 | 8.0 | 7.7 | 60 | 8000 | 140 | 0.75 | | | |
| MDSKA 090-22, 80 | 83 | 2300 | 10.8 | 2.6 | 390 | 5.5 | 12.8 | 6.0 | 100 | 8000 | 80 | 0.81 | 36 | 22.9 | 090, C160 |
| MDSKA 090-22, 140 | | 4110 | 9.5 | 4.1 | 350 | 10.2 | 12.8 | 12.0 | 100 | 8000 | 140 | 0.80 | | | |
| MDSKA 100-22, 80 | 96 | 2340 | 16.3 | 4.0 | 390 | 8.2 | 22.5 | 9.85 | 180 | 8000 | 80 | 0.80 | 72 | 44.7 | 112, C160 |
| MDSKA 100-22, 140 | | 4150 | 12.0 | 5.2 | 330 | 14.0 | 22.5 | 19.7 | 180 | 8000 | 140 | 0.78 | | | |
| MDSKA 112-22, 85 | 107 | 2490 | 24.6 | 6.4 | 390 | 13.5 | 39 | 15.9 | 300 | 8000 | 85 | 0.83 | 180 | 60 | 132, A300 |
| MDSKA 112-22, 140 | | 4160 | 17.0 | 7.4 | 320 | 19.8 | 39 | 31.8 | 300 | 8000 | 140 | 0.80 | | | |
| with separate fan | | | | | | | | | | | | | | | |
| MDFKA 071-22, 120 | 65 | 3410 | 6.3 | 2.2 | 390 | 6.0 | 7.0 | 6.3 | 32 | 8000 | 120 | 0.75 | 8.3 | 12.0 | 080, C160 |
| MDFKA 080-22, 60 | 71 | 1635 | 12.0 | 2.1 | 390 | 4.8 | 13.5 | 5.25 | 60 | 8000 | 60 | 0.81 | 19.2 | 16.9 | 090, C160 |
| MDFKA 080-22, 120 | | 3455 | 10.8 | 3.9 | 390 | 9.1 | 13.5 | 10.5 | 60 | 8000 | 120 | 0.80 | | | |
| MDFKA 090-22, 60 | 83 | 1680 | 21.5 | 3.8 | 390 | 8.5 | 23.9 | 9.05 | 100 | 8000 | 60 | 0.80 | 36 | 25.5 | 090, C160 |
| MDFKA 090-22, 120 | | 3480 | 19.0 | 6.9 | 390 | 15.8 | 23.9 | 18.1 | 100 | 8000 | 120 | 0.80 | | | |
| MDFKA 100-22, 60 | 96 | 1700 | 36.3 | 6.4 | 390 | 13.9 | 40.0 | 15.4 | 180 | 8000 | 60 | 0.83 | 72 | 48.2 | 112, C160 |
| MDFKA 100-22, 120 | | 3510 | 36.0 | 13.2 | 390 | 28.7 | 40.0 | 30.8 | 180 | 8000 | 120 | 0.80 | | | |
| MDFKA 112-22, 60 | 107 | 1710 | 61.4 | 11.0 | 390 | 22.5 | 75 | 25.8 | 300 | 8000 | 60 | 0.85 | 180 | 63.5 | 132, A300 |
| MDFKA 112-22, 120 | | 3520 | 55.0 | 20.3 | 390 | 42.5 | 75 | 49.5 | 300 | 8000 | 120 | 0.80 | | | |

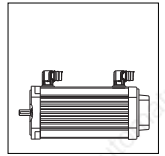
1) without brake, with resolver

2) with 390 V, idle running M = 0

3) frame size and flange of a standard motor with similar flange and shaft dimensions

5) when V_{rated} · P = P_{rated} up to 2.3 · n_{rated}

6) magnetic / mechanical permissible torque



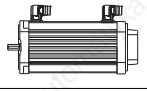
Asynchronous servo motors series MDFQA (enclosed ventilated)

| Motor type | Conne- ction | h [mm] | n _{rated} [min ⁻¹] | M _{rated} [Nm] | P _{rated} ⁵⁾ [kW] | V _{rated} ³⁾ [V] | I _{rated} [A] | M ₀ [Nm] | I ₀ [A] | M _{max} ⁶⁾ [Nm] | f [Hz] | η | cosφ | n _{max} [min ⁻¹] | J ¹⁾ [kgcm ²] | m ¹⁾ [kg] | Gearbox connection corresponds to standard motor 3) |
|-------------------|-----------------|-----------|--|----------------------------|--|---|---------------------------|------------------------|-----------------------|--|-----------|------|------|--|---|-------------------------|---|
| MDFQA 100-22, 50 | Y | 100 | 1420 | 71.3 | 10.6 | 360 | 26.5 | 76 | 27.0 | 250 | 50 | 0.76 | 0.84 | 5000 | 180 | 65 | 132, A300 |
| MDFQA 100-22, 100 | Y | 100 | 2930 | 66.2 | 20.3 | 360 | 46.9 | 76 | 54.0 | 250 | 100 | 0.87 | 0.80 | | | | |
| MDFQA 112-22, 50 | Y | 112 | 760 | 145 | 11.5 | 360 | 27.2 | 156 | 29.5 | 500 | 28 | 0.78 | 0.87 | 4500 | 470 | 115 | 132, A300 |
| | Δ | | 1425 | 135 | 20.1 | 360 | 43.7 | 156 | 51.0 | 500 | 50 | 0.86 | 0.86 | | | | |
| MDFQA 112-22, 100 | Y | 112 | 1670 | 130 | 22.7 | 360 | 49.1 | 156 | 59.0 | 500 | 58 | 0.87 | 0.85 | | | | |
| | Δ | | 2935 | 125 | 38.4 | 360 | 81.9 | 156 | 102.0 | 500 | 100 | 0.90 | 0.83 | | | | |
| MDFQA 132-32, 36 | Y | 132 | 550 | 296 | 17.0 | 360 | 45.2 | 325 | 52.6 | 1100 | 20 | 0.74 | 0.81 | 4500 | 1310 | 170 | 200, A400 |
| | Δ | | 1030 | 288 | 31.1 | 360 | 77.4 | 325 | 90.2 | 1100 | 36 | 0.84 | 0.77 | | | | |
| MDFQA 132-32, 76 | Y | 132 | 1200 | 282 | 35.4 | 360 | 88.8 | 325 | 109.0 | 1100 | 42 | 0.82 | 0.78 | | | | |
| | Δ | | 2235 | 257 | 60.1 | 340 | 144.8 | 325 | 196.5 | 1100 | 76 | 0.88 | 0.80 | | | | |

- 1) without brake, with resolver
- 2) with 390 V, idle running M = 0
- 3) frame size and flange of a standard motor with similar flange and shaft dimensions
- 5) when $V_{rated} \cdot P = P_{rated}$ up to $2.3 \cdot n_{rated}$
- 6) magnetic/mechanical permissible torque



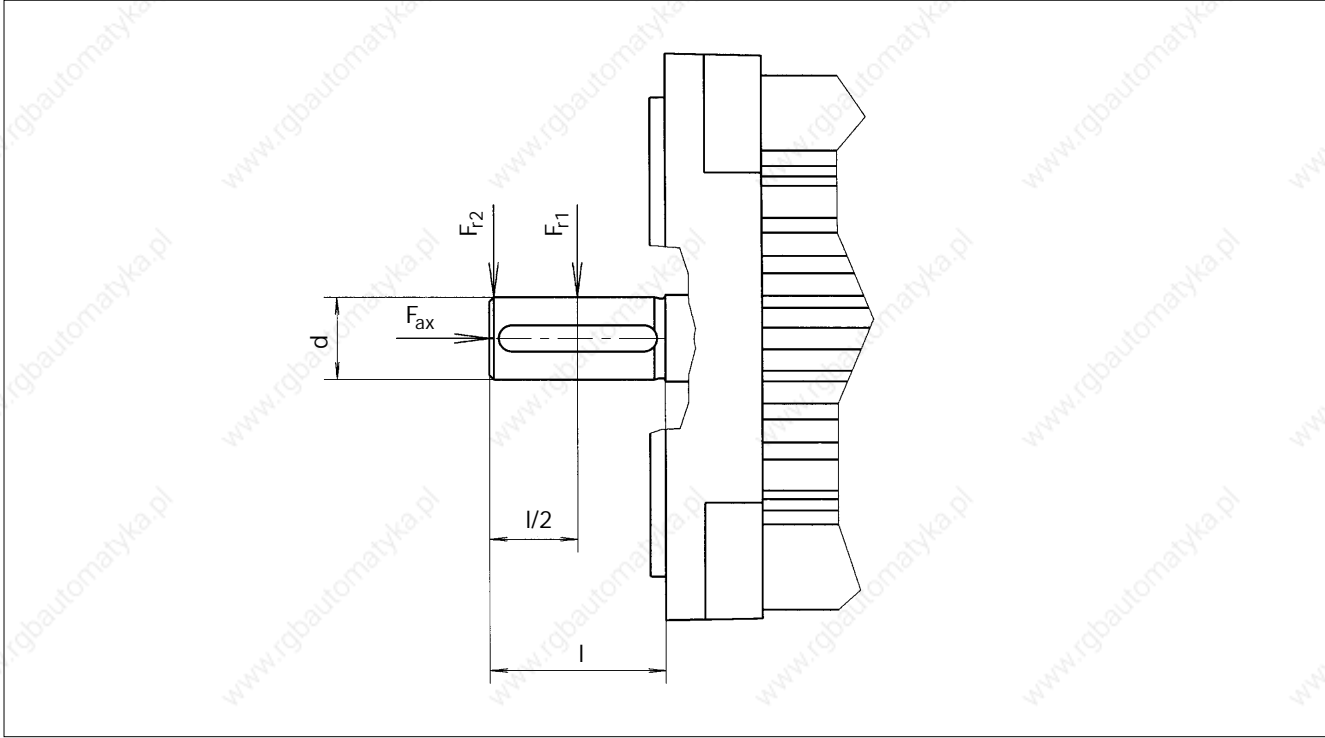
9300



Technical data

Rated data

Permissible shaft load



Series MDXKX (surface ventilated)

| Motor type | d x l [mm] | F _a [N] | F _{r1} [N] | F _{r2} [N] |
|------------|---------------|-----------------------|------------------------|------------------------|
| MDXKS 036 | 11 x 23 | 70 | 250 | 180 |
| MDXKX 056 | 14 x 30 | 100 | 330 | 250 |
| MDXKX 071 | 19 x 40 | 150 | 600 | 400 |
| MDXKX 080 | 24 x 50 | 200 | 700 | 600 |
| MDXKX 090 | 24 x 50 | 260 | 1000 | 900 |
| MDXKX 100 | 28 x 60 | 500 | 1500 | 1400 |
| MDXKX 112 | 38 x 80 | 700 | 2000 | 1700 |

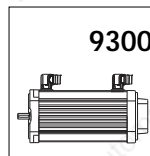
Series MDFQA (enclosed ventilated)

| Motor type | d x l [mm] | F _a [N] | F _{r1} [N] | F _{r2} [N] |
|------------|---------------|-----------------------|------------------------|------------------------|
| MDFQA 100 | 38 x 80 | 900 | 2300 | 1000 |
| MDFQA 112 | 38 x 80 | 1300 | 2300 | 1350 |
| MDFQA 132 | 55 x 110 | 3500 | 4950 | 3580 |

Calculation basis:

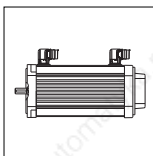
Bearing life: $L_{h10} = 20.000$ h, torque $M = 2.5 M_{rated}$

Linear interpolation between F_{r1} and F_{r2} possible.



Fans

| Motor type | Fan type | V _{rated} [V] | f _{rated} [Hz] | I _{rated} [A] | P _{rated} [W] |
|------------|--|---------------------------|----------------------------|---------------------------|---------------------------|
| MDFK 071 | | 210...240, 1~ | 50/60 | 0.12 | 19 |
| MDFK 080 | | 210...240, 1~ | 50/60 | 0.12 | 19 |
| MDFK 090 | | 210...240, 1~ | 50/60 | 0.32 | 46 |
| MDFK 100 | | 210...240, 1~ | 50/60 | 0.32 | 46 |
| MDFK 112 | | 210...240, 1~ | 50/60 | 0.26 | 60 |
| MDFQA 100 | G2D 120 | 380...460, 3~ | 50/60 | 0.11 | 60 |
| MDFQA 100 | G2D 140 with filter | 380...460, 3~ | 50/60 | 0.25 | 150 |
| MDFQA 100 | DNG 3-4,5 with or without filter with large voltage range | 350...540, 3~ | 50/60 | 0.25 | 100 |
| MDFQA 112 | G2D 160 with filter | 380...460, 3~ | 50/60 | 0.5 | 320 |
| MDFQA 112 | DNG 5-12,5 with or without filter with large voltage range | 350...540, 3~ | 50/60 | 0.75 | 390 |
| MDFQA 132 | G2D 180 | 380...460, 3~ | 50/60 | 0.66 | 415 |
| MDFQA 132 | DNG 8-12 with or without filter with large voltage range | 350...540, 3~ | 50/60 | 1.4 | 660 |



Technical data

Attachments

Brake

The servo motors MDXKX can be equipped with integrated permanent magnet holding brakes for 24 V DC (industrial type 205 V).

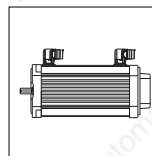
The enclosed ventilated asynchronous servo motors MDFQA can be equipped with a 205 V or 24 V spring operated brake.

The brakes are active after switching off the power supply (normally on principle).

When using the brakes for holding applications only, the friction linings are virtually resistant to wear. If the permissible friction work is not exceeded, at least 150 emergency stop operations are possible.

| Motor type | M_B [Nm] | $V_{rated\ 24}$ [V] | I_{24} [A] | $V_{rated\ 205}$ [V] | I_{205} [A] |
|--|---------------|----------------------------------|-----------------|------------------------------------|------------------|
| MDSKXBX 036 | 2.5 | 24 (+5%, -10%) | 0.50 | 205 (+5%, -10%) | 0.06 |
| MDSKXBX 056 with direct gearbox connection | 2.5 5 | 24 (+5%, -10%) 24 (+5%, -10%) | 0.50 0.67 | 205 (+5%, -10%) 205 (+5%, -10%) | 0.06 0.08 |
| MDXKXBX 071 with direct gearbox connection | 10 12 | 24 (+5%, -10%) 24 (+5%, -10%) | 0.67 0.75 | 205 (+5%, -10%) 205 (+5%, -10%) | 0.08 0.09 |
| MDXKABX 080 with direct gearbox connection | 12 20 | 24 (+5%, -10%) 24 (+5%, -10%) | 0.75 1.00 | 205 (+5%, -10%) 205 (+5%, -10%) | 0.09 0.12 |
| MDXKABX 090 with direct gearbox connection | 20 20 | 24 (+5%, -10%) 24 (+5%, -10%) | 0.75 1.00 | 205 (+5%, -10%) 205 (+5%, -10%) | 0.09 0.12 |
| MDXKABX 100 with direct gearbox connection | 40 40 | 24 (+5%, -10%) 24 (+5%, -10%) | 1.00 1.46 | 205 (+5%, -10%) 205 (+5%, -10%) | 0.12 0.18 |
| MDXKABX 112 with direct gearbox connection | 80 80 | 24 (+5%, -10%) 24 (+5%, -10%) | 1.46 1.46 | 205 (+5%, -10%) 205 (+5%, -10%) | 0.18 0.18 |
| MDFQABX 100 | 80 150 | 24 (+5%, -10%) 24 (+5%, -10%) | 2.29 3.54 | 205 (+5%, -10%) 205 (+5%, -10%) | 0.27 0.41 |
| MDFQABX 112 | 150 240 | 24 (+5%, -10%) 24 (+5%, -10%) | 3.54 4.17 | 205 (+5%, -10%) 205 (+5%, -10%) | 0.41 0.49 |
| MDFQABX 132 | 240 360 | 24 (+5%, -10%) 24 (+5%, -10%) | 4.17 4.58 | 205 (+5%, -10%) 205 (+5%, -10%) | 0.49 0.54 |

The employed brakes are no safety brakes in the real sense of the word, i.e. in case of disruption by not influencable factors, like penetration of oil or failure of the A-side shaft seal, a reduction of torque may occur.



| Motor type | t ₁ , t _{is} ¹⁾ [ms] | t ₂ , t _{auf} [ms] | Q _{E2} ²⁾ [kJ] | Sh _ü ³⁾ [1/h] | J _B [kgcm ²] | m [kg] |
|--|--|---|---------------------------------------|--|--|--------------|
| MDSKXBX 036 | 8 | 18 | 3.2 | 31 | 0.38 | 0.85 |
| MDSKXBX 056 with direct gearbox connection | 8 13 | 18 22 | 3.2 6.5 | 31 23 | 0.38 1.06 | 0.85 0.75 |
| MDXKXBX 071 with direct gearbox connection | 20 24 | 29 30 | 6.5 12.0 | 23 17 | 1.06 3.60 | 0.83 1.38 |
| MDXKABX 080 with direct gearbox connection | 24 28 | 30 55 | 12.0 25.0 | 17 12 | 3.60 3.60 | 1.45 1.45 |
| MDXKABX 090 with direct gearbox connection | 25 28 | 50 55 | 12.0 25.0 | 17 12 | 3.60 9.50 | 1.54 2.42 |
| MDXKABX 100 with direct gearbox connection | 28 40 | 73 100 | 25.0 50.0 | 12 9 | 9.50 31.80 | 2.72 4.79 |
| MDXKABX 112 with direct gearbox connection | 53 53 | 97 97 | 50.0 50.0 | 9 9 | 31.80 31.80 | 4.98 4.98 |
| MDFQABX 100 | 90 110 | 180 300 | 37 60 | 27 20 | 15.00 29.00 | 13.5 20 |
| MDFQABX 112 | 110 200 | 300 400 | 60 80 | 20 19 | 29.00 73.00 | 21.5 31 |
| MDFQABX 132 | 200 270 | 400 500 | 80 120 | 19 17 | 73.00 200.00 | 32.5 46 |

- 1) Engagement time for DC switching, for AC switching t_{is} prolonged by approx. factor 4
- 2) Max. friction work per switching operation with n = 1500 min⁻¹
- 3) Transference operating frequency to VDI 2241 to detect the permissible operating frequency or friction work

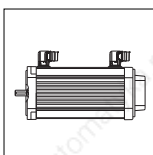
With long motor cables and especially with 24V brakes, the ohmic voltage drop along the cable must be observed and compensated by a higher voltage input – otherwise, the voltage applied to the brake will not be high enough (24V or 205V).

For Lenze system cables the following applies:

$$\Delta V_B = 0.08 \cdot I_{\text{cable}} [\text{m}] \cdot I_B [\text{A}]$$

If the voltage applied to the brake is not correct (too high, too low, wrong polarity), the brake is activated immediately and can be overheated and destroyed by the still rotating motor.

Shortest switching times of the brake can be reached by DC switching of the voltage. A spark suppresser avoids voltage peaks.



Technical data

Attachments

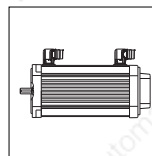
Angle and speed encoder for servo motors MDXK and MDXQ

| Encoder | Resolver | Incremental encoder | Sin-Cosen encoder single turn | Sin-Cos encoder multi turn |
|--|---|---|--|----------------------------|
| Available for | | | | |
| Synchronous servo motor MDXKS | ● | | ● | ● |
| Asynchronous servo motor MDXKA (surface cooled) | ● | ● | ● | ● |
| Asynchronous servo motor MDXQA (enclosed ventilated) | ● | ● | ● | ● |
| Designation | RS | IT2048 | AS512 | AM512 |
| Type | | ITD21 | SCS70 | SCM70 |
| Signals | | 2048 bars TTL signals | 512 periods, sine signals 1 V _{ss} asynchronous half-duplex interface RS485 for transmission of the absolute position | |
| Resolution | 0.8' | 2.6' | 0.4' | 0.4' |
| Accuracy | + - 10' bzw. + - 4' when entering the correction code | + - 2' depending on no. of bars | + - 0.8' | + - 0.8' |
| Absolute positioning | 1 revolution | no | 1 revolution | 4096 rev. |
| Note | Standard solution for most applications | Incremental encoder instead of resolver | Sin-Cos encoder instead of resolver current position via interface of the 9300. Operation only possible after encoder selection at 9300 (encoder type and voltage supply), values saves, and unit switched off and on again. | |

Resolver (built-in encoder)

Stator-fed resolver with 2 stator windings turned by 90° and a rotor winding with transformer winding.

| | | |
|-------------------------|---|----------------|
| Design | Brushless hollow shaft resolver in pancake-design | |
| Max. speed (permanent) | 8000 min ⁻¹ | |
| Max. speed (short time) | 10000 min ⁻¹ | |
| Input voltage | 10 V amplitude | |
| Input frequency | 4 kHz | |
| Ratio stator / rotor | 0.3 ± 5 % | |
| Rotor impedance | Z _{ro} | 51Ω + j90 Ω |
| Stator impedance | Z _{s0} | 102 Ω + j150 Ω |
| Impedance | Z _{rs} | 44 Ω + j76 Ω |
| Insulation resistance | > 10 MΩ with 500 V DC | |
| No. of pole pairs | 1 | |
| Max. phase error | ± 10 angular minutes | |



Sin-Cos absolute value encoder (built-in encoder)

Absolute value encoder with 2 sine-wave signals displaced by 90° with 512 periods per revolution and serial interface RS 485 for the transmission of

parameters and the absolute position within one or 4096 revolutions.

| Type | SCS 70 |
|--|--|
| Design | Brushless hollow shaft encoder |
| Maximum torque | 12000 min ⁻¹ |
| No. of revolutions absolutely resolved | 1 (single turn) |
| No. of periods | 512 periods / rev. |
| Output signals | 2 sine-wave signals displaced by 90° with 1 V _{SS} , serial interface RS 485, asynchronous, half duplex |
| Limit frequency | 100 kHz |
| Voltage supply | 7 ... 12 V |
| Current consumption | 100 ... 130 mA |

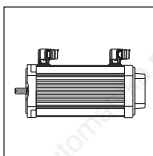
| Type | SCM 70 |
|--|--|
| Design | Brushless hollow shaft encoder |
| Maximum torque | 12000 min ⁻¹ |
| No. of revolutions absolutely resolved | 4096 (multi turn) |
| No. of periods | 512 periods / rev. |
| Output signals | 2 sine-wave signals displaced by 90° with 1 V _{SS} , serial interface RS 485, asynchronous, half duplex |
| Limit frequency | 100 kHz |
| Versorgung | 7 ... 12 V |
| Current consumption | 100 ... 130 mA |

Incremental encoder (built-in encoder)

Encoder with 2 TTL square-wave signals displaced by 90° with 2048 pulses per revolution and additional zero track.

This encoder is optionally available as preference feedback to the resolver for motor series MDFQA.

| Type | ITD 21 |
|---------------------|--|
| Design | Brushless hollow shaft encoder |
| Maximum torque | 8000 min ⁻¹ |
| No. of pulses | 2048 pulses / rev. |
| Output signals | 2 square-wave signals displaced by 90°, zero pulse, complementary TTL signals, V _{low} ≤ 0.5 V, V _{high} ≥ 2.5 V |
| Voltage supply | 5 V ± 5 %, protect against polarity reversal |
| Current consumption | ≤ 150 mA |
| Limit frequency | 300 kHz |



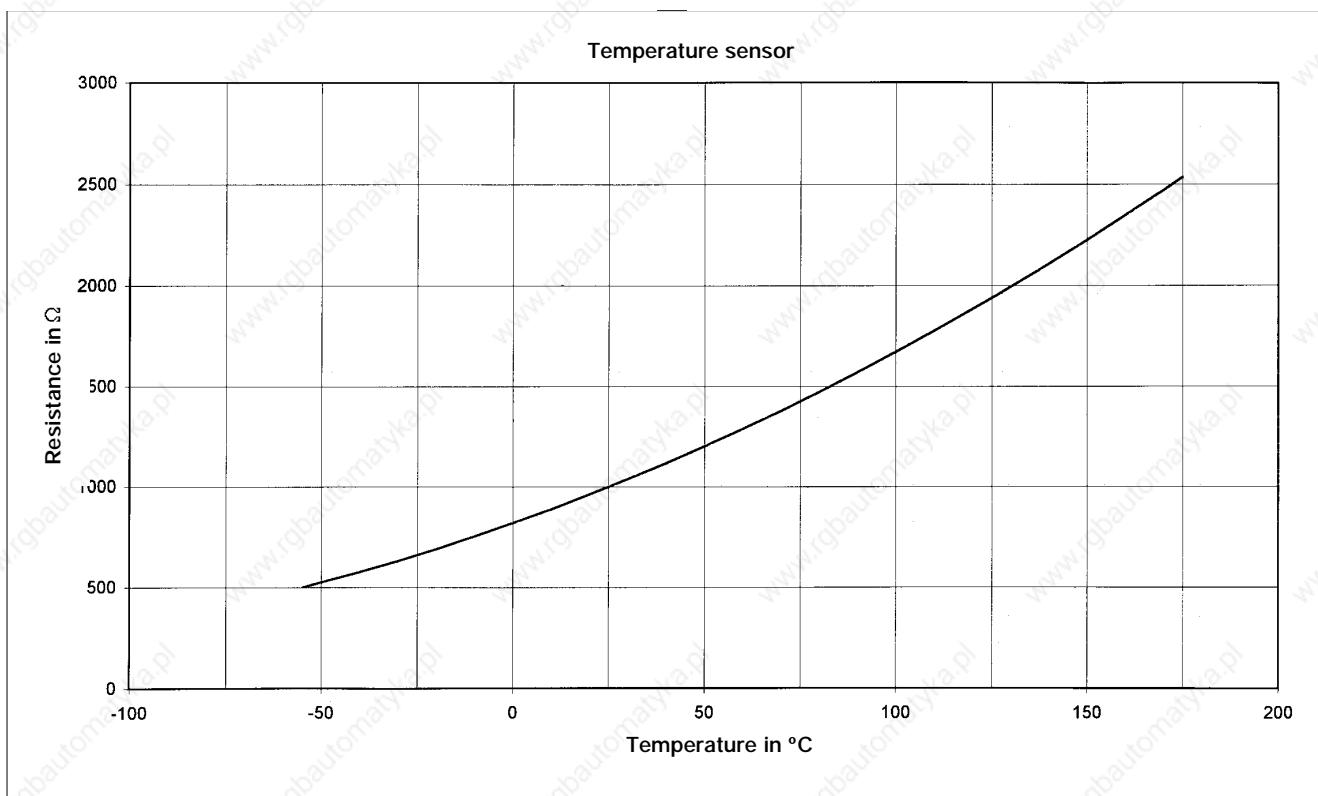
Technical data

Attachments

Temperature sensor KTY 83-110 (integrated)

The KTY temperature sensor continuously measures the motor temperature. It represents, though, no complete protection. The signals are fed back to the servo inverter

9300 via the system feedback cable. When feeding the encoder with a measuring current of 1 mA, temperature and resistance show the following characteristic:



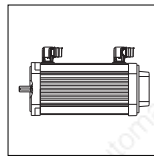
Temperature switch – normally closed contact

As alternative to the continuous sensor KTY, with the MDFQA it is also possible to use a temperature contact to monitor the windings.

Asynchronous motors of the series MDFQA are equipped with both temperature monitoring.

Technical data

| | AC connection | DC connection | | |
|---------------------|---------------|---------------|--------|-------|
| Release temperature | | 150 °C ± 5 °C | | |
| Reset temperature | | 90 ... 135 °C | | |
| Connection voltage | 250 V ≈ | 60 V | 48 V | 24 V |
| Rated current [A] | 2.5 A | 1.0 A | 1.25 A | 1.6 A |

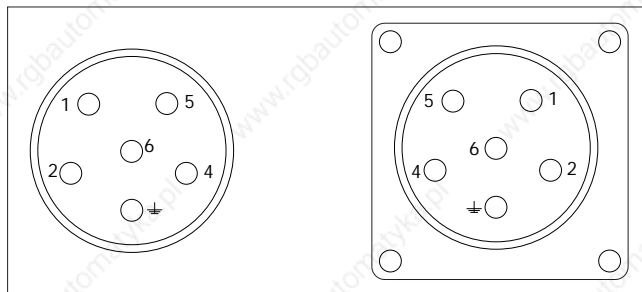


Plug-in connectors for motor connection

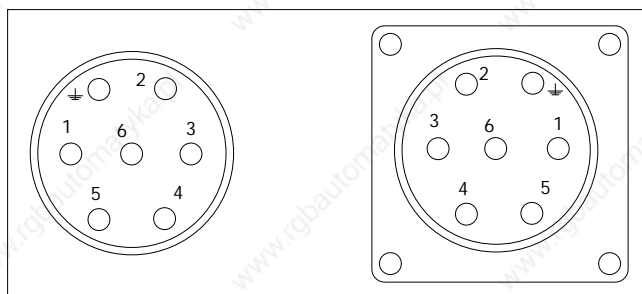
Power connection, brake connection

| | Pin no. | Terminal designation |
|-----------------------------------|---------------------------------|----------------------|
| Holding brake +UB | 1 | Y1 |
| Holding brake -UB | 2 | Y2 |
| Earth PE | ⊕ | ⊕ |
| Motor power phase U | 4 | 1, U1 |
| Motor power phase V | 5 | 2, V1 |
| Motor power phase W | 6 | 3, W1 |
| Global Drive system cables | | |
| Standard cable | EWLMxxxGM-015C MDXK036...090 | |
| | EWLMxxxGM-025 MDXK036...090 | |
| | EWLMxxxGM-040 MDXKA100...112 | |
| | EWLMxxxGM-100 MDXKA100...112 | |
| Trailing cable | EWLMxxxGMS025 MDXKA036...090 | |
| | EWLMxxxGMS040 MDXKA100...112 | |
| Intermediate cable | EWLMxxxZM-015 MDXKA036...090 | |

MDXK 036...090



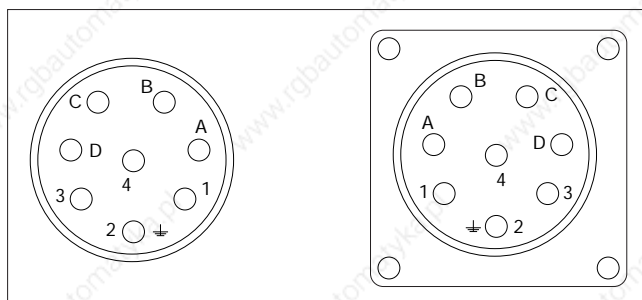
MDXKA 100...112

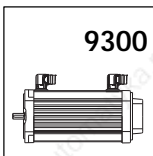


Fan connection

| | Pin no. | Terminal designation |
|-----------------------------------|------------|----------------------|
| Earth PE | 2 | ⊕ |
| Fan power L1 | A | U1 |
| Fan power N | B | U2 |
| Global Drive system cables | | |
| Standard cable | EWLLxxxGM | |
| Trailing cable | EWLLxxxGMS | |
| Intermediate cable | EWLLxxxZM | |

MDXK





9300

Technical data

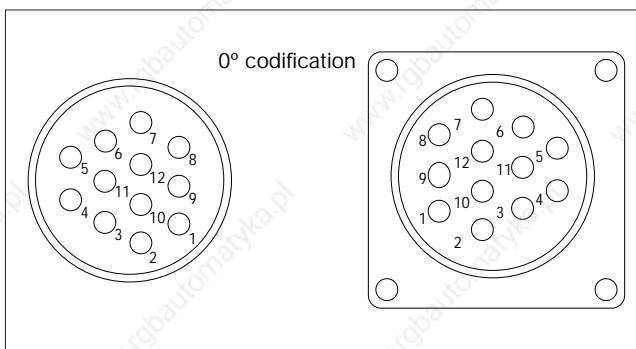
Motor connection

Plug-in connectors for motor connection

Resolver connection

| | Pin no. | Terminal designation |
|--|-------------|----------------------|
| +Ref., transformer / reference winding | 1 | B1 |
| -Ref., transformer / reference winding | 2 | B2 |
| +Cos, stator winding | 4 | B4 |
| -Cos, stator winding | 5 | B5 |
| +Sin, stator winding | 6 | B6 |
| -Sin, stator winding | 7 | B7 |
| Temperature sensor +KTY | 11 | T1 |
| Temperature sensor -KTY | 12 | T2 |
| Global Drive system cables | | |
| Standard cable | EWLRxxxGM-T | |
| Intermediate cable for trailing | EWLRxxxZMST | |
| Intermediate cable | EWLRxxxZM-T | |

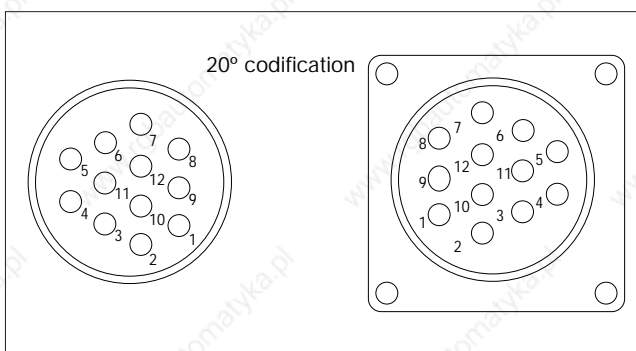
MDXK, MDFQA

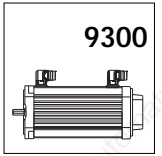


Connection of Sin-Cos absolute value and incremental encoder

| | Pin no. | Terminal designation |
|-----------------------------------|-------------|----------------------|
| Track +B / +SIN | 1 | B5 |
| Track -A / -COS | 2 | B4 |
| Track +A / +COS | 3 | B3 |
| Supply VCC | 4 | B1 |
| Mass GND | 5 | B2 |
| Track -0, -Z / -RS485 | 6 | B8 |
| Track +0, +Z / +RS485 | 7 | B7 |
| Track -B / -SIN | 9 | B6 |
| Temperature sensor +KTY | 11 | T1 |
| Temperature sensor -KTY | 12 | T2 |
| Global Drive system cables | | |
| Standard cable | EWLExxxGM-T | |

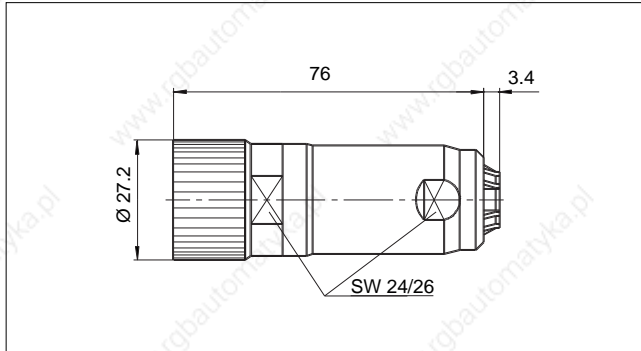
MDXK, MDFQA



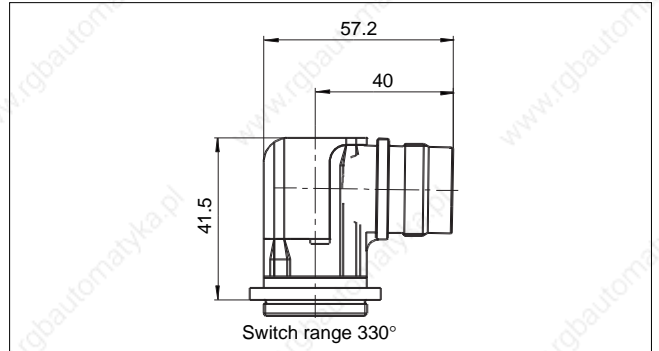


Dimensions of plugs and sockets

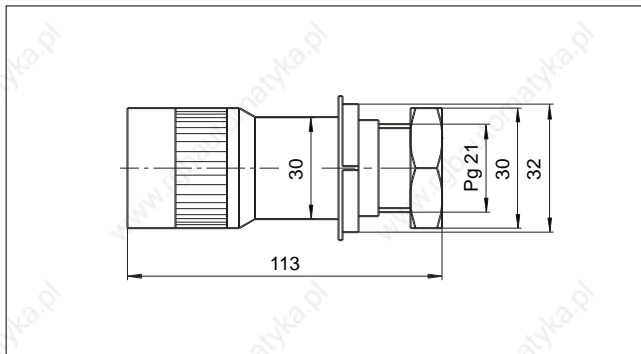
Power plug size 036 ... 090



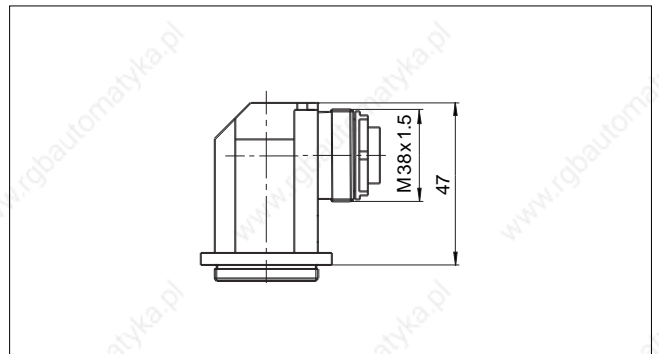
Right angle socket motor size 036 ... 090



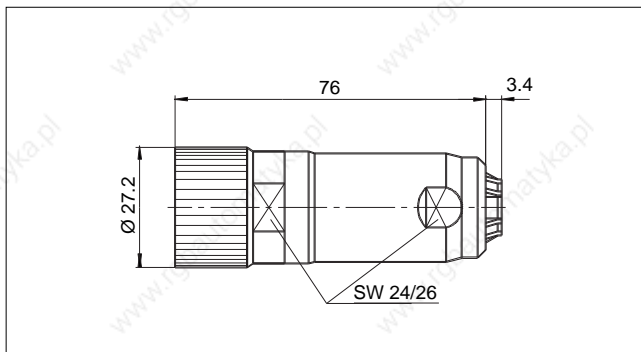
Power plug size 100 ... 112



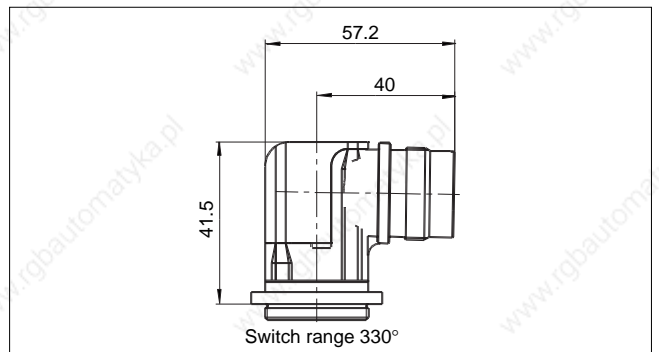
Right angle socket motor size 100 ... 112



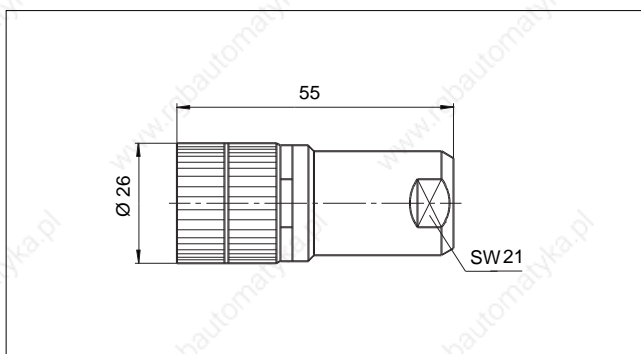
Fan plug



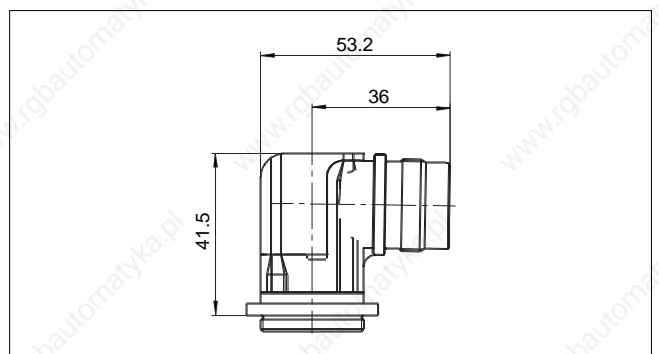
Right-angle socket fan

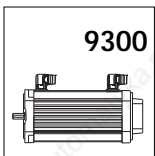


Encoder plug (resolver / Sin-Cos / incremental encoder)



Right-angle socket encoder





9300

Technical data

Motor connection

Terminal box

As alternative to plug-in connectors, servo motors MDXK can be equipped with terminal boxes for power connection and brake.

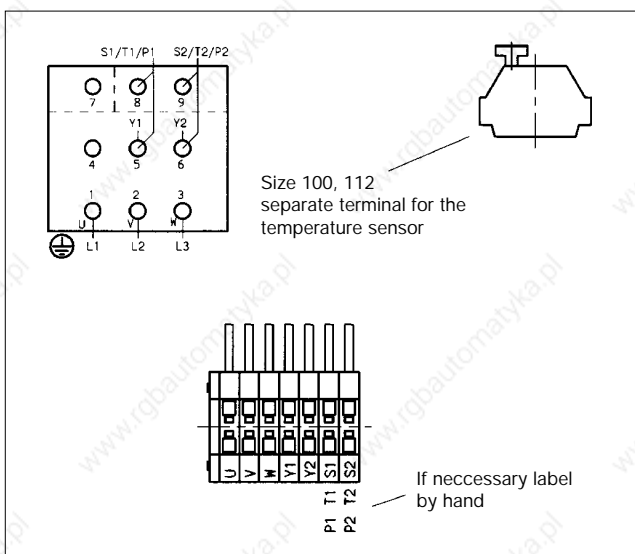
The power connection of servo motors MDFQA (enclosed ventilated) is always equipped with a terminal box.

a) Motor MDXK

Connections

| | Pin no. | Terminal designation |
|------------------|---------|----------------------|
| Brake | 5 | Y1 |
| Brake | 6 | Y2 |
| Protective earth | PE | PE |
| Motor phase | 1 | U |
| Motor phase | 2 | V |
| Motor phase | 3 | W |

Terminals



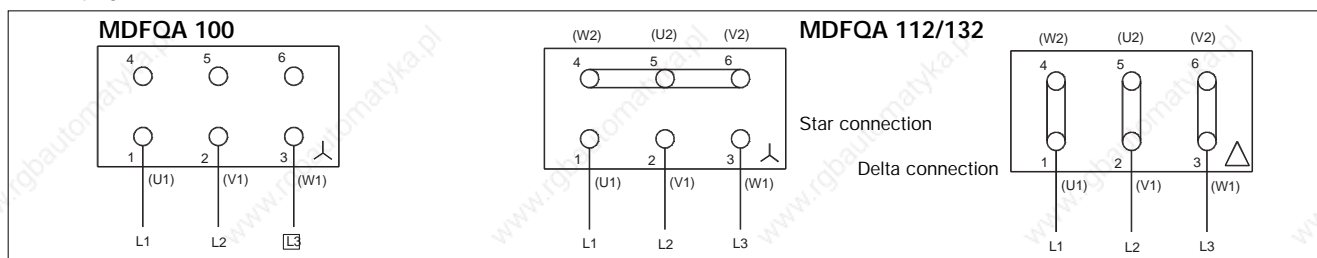
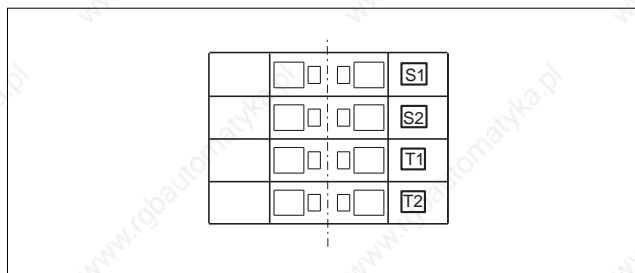
b) Motor MDFQA

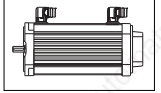
Connections

| | Terminal designation |
|--|----------------------|
| Protective earth | PE |
| Motor phase | U |
| Motor phase | V |
| Motor phase | W |
| Thermostat, connection T1 with 9300 | S1 |
| Thermostat, connection T2 with 9300 | S2 |
| Temperature sensor*, KTY, con. through encoder | T1 |
| Temperature sensor*, KTY, con. through encoder | T2 |

* Motors with feedback have the temperature sensor connected to the encoder plug.

Terminals





Motor connection

Feedbacks and fans can be connected to a second terminal box.

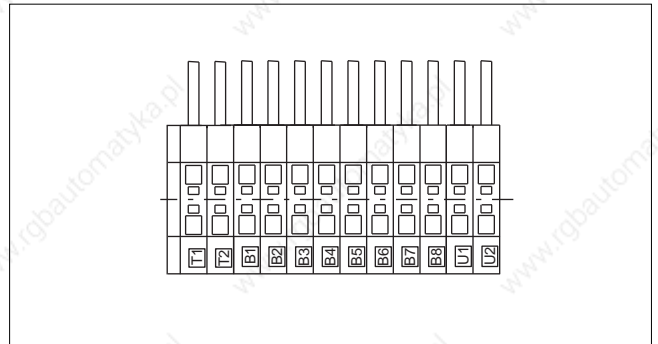
The feedback of servo motors MDFQA (enclosed ventilated) is always equipped with plug-in connectors.

Resolver as feedback

Connections

| | Pin no. | Terminal designation |
|--------------------|---------|----------------------|
| Temperature sensor | T1 | + KTY |
| Temperature sensor | T2 | - KTY |
| Resolver | B1 | + Ref |
| Resolver | B2 | - Ref |
| | B3 | |
| Resolver | B4 | + cos |
| Resolver | B5 | - cos |
| Resolver | B6 | + sin |
| Resolver | B7 | - sin |
| | B8 | |
| Separate fan | U1 | L1 |
| Separate fan | U2 | N |

Terminals

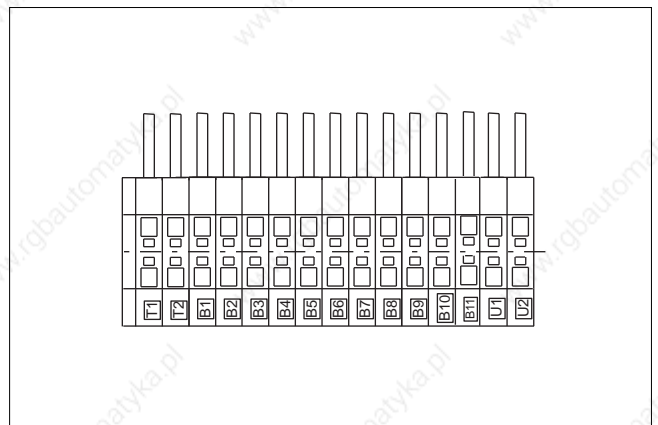


Incremental encoder of SinCos-encoder as feedback

Connections

| | Pin no. | Terminal designation |
|--|---------|----------------------|
| Temperature sensor | T1 | + KTY |
| Temperature sensor | T2 | - KTY |
| Incremental encoder supply + | B1 | + UB |
| Incremental encoder supply - | B2 | ± ov |
| Incremental encoder track A | B3 | A |
| Incremental encoder track A invers | B4 | - A |
| Incremental encoder track B | B5 | B |
| Incremental encoder track B invers | B6 | - B |
| Inc. encoder track C (zero track) | B7 | N |
| Inc. encoder track C (zero track invers) | B8 | N |
| Incremental encoder mass / sensor | B9 | ± ov |
| Incremental encoder screen | B10 | Screen |
| Incremental encoder screen + | B11 | + U sensor |
| Separate fan | U1 | L1 |
| Separate fan | U2 | N |

Terminals

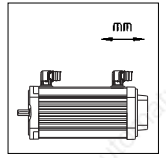


PG glands and bolts

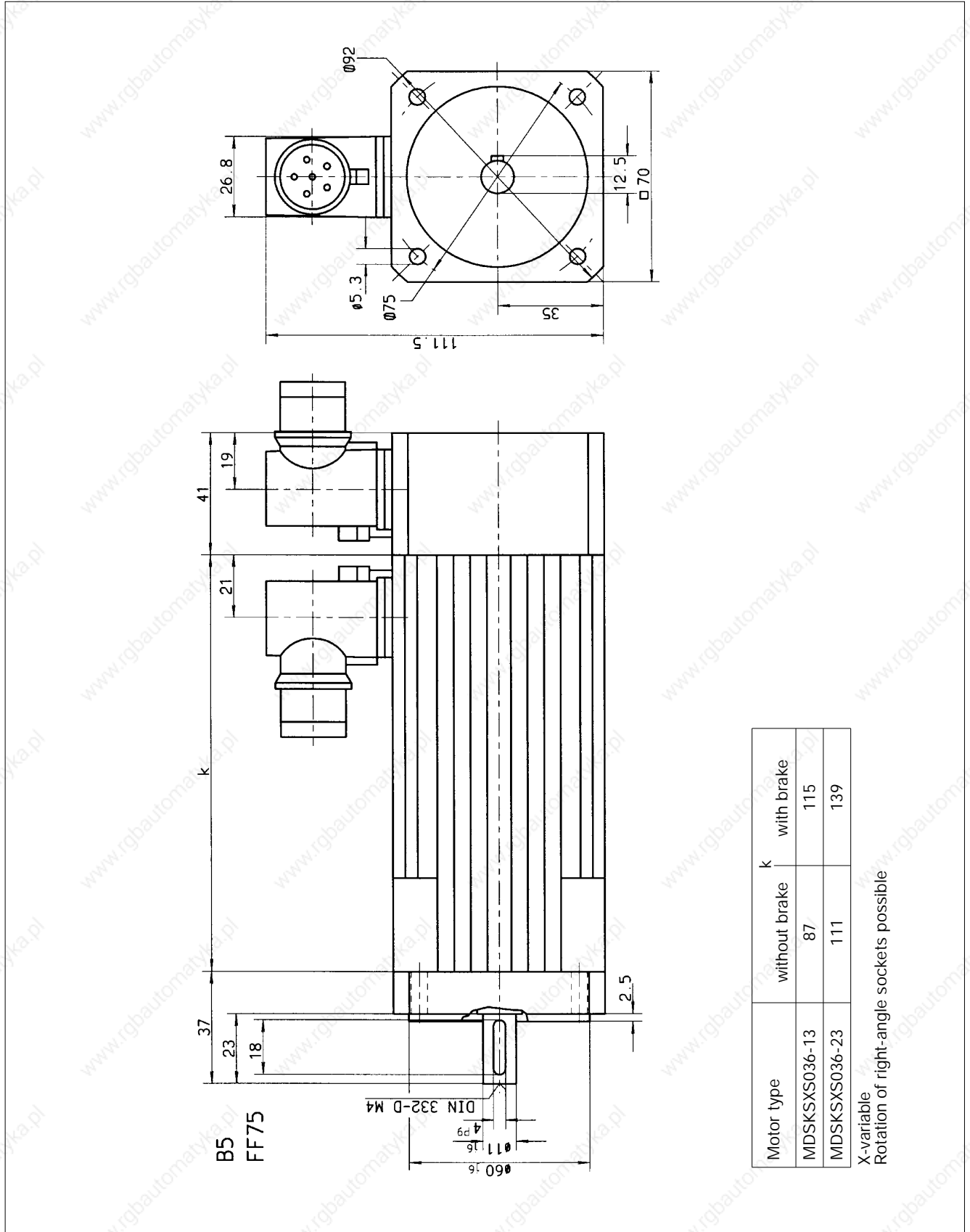
| Motor type | Power connection | | Encoder / fan connection |
|------------|-------------------|------------------------------------|---------------------------|
| | PG glands | Bolts | PG glands |
| MDSK 056 | 1xPG13.5 + 1xPG11 | M4 bzw. 0.08...2.5 mm ² | 1xPG13.5 + 1xPG11 + 3xPG7 |
| MDXK 071 | 1xPG13.5 + 1xPG11 | M4 bzw. 0.08...2.5 mm ² | 1xPG13.5 + 1xPG11 + 3xPG7 |
| MDXK 080 | 1xPG13.5 + 1xPG11 | M4 bzw. 0.08...2.5 mm ² | 1xPG13.5 + 1xPG11 + 3xPG7 |
| MDSK 090 | 1xPG13.5 + 1xPG11 | M4 bzw. 0.08...2.5 mm ² | 1xPG13.5 + 1xPG11 + 3xPG7 |
| MDXK 100 | 2x PG16 | M5 | 2xPG16 + 3x PG7 |
| MDXK 112 | 1xPG21 + 1xPG16 | M5 | 2xPG16 + 3x PG7 |
| | Power connection | | Fan connection |
| MDFQ 100 | 2xPG29 + 1xPG9 * | M6 | 1xPG9 |
| MDFQ 112 | 2xPG36 + 2xPG9 * | M8 | 1xPG9 |
| MDFQ 132 | 4xPG29 + 2xPG9 * | M12 | 1xPG9 |

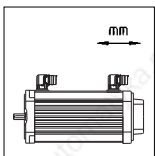
* For connection of parallel screened cables, e.g. 3 St 4 x 35 mm² or 4 St 4 x 25 mm²

Dimensions



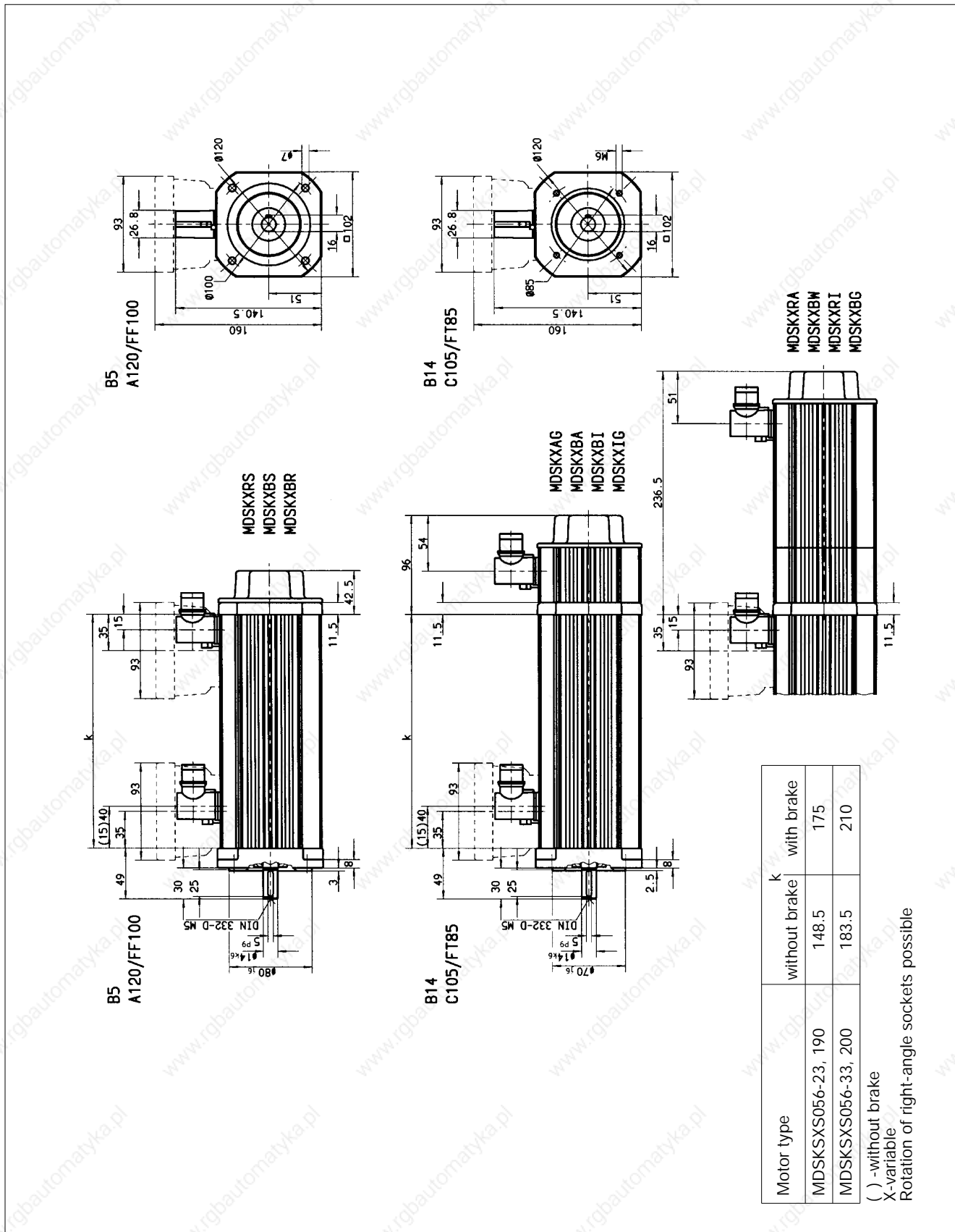
Synchronous servo motors MDSKS 036, mounting position B5

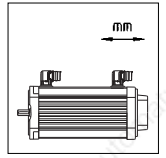




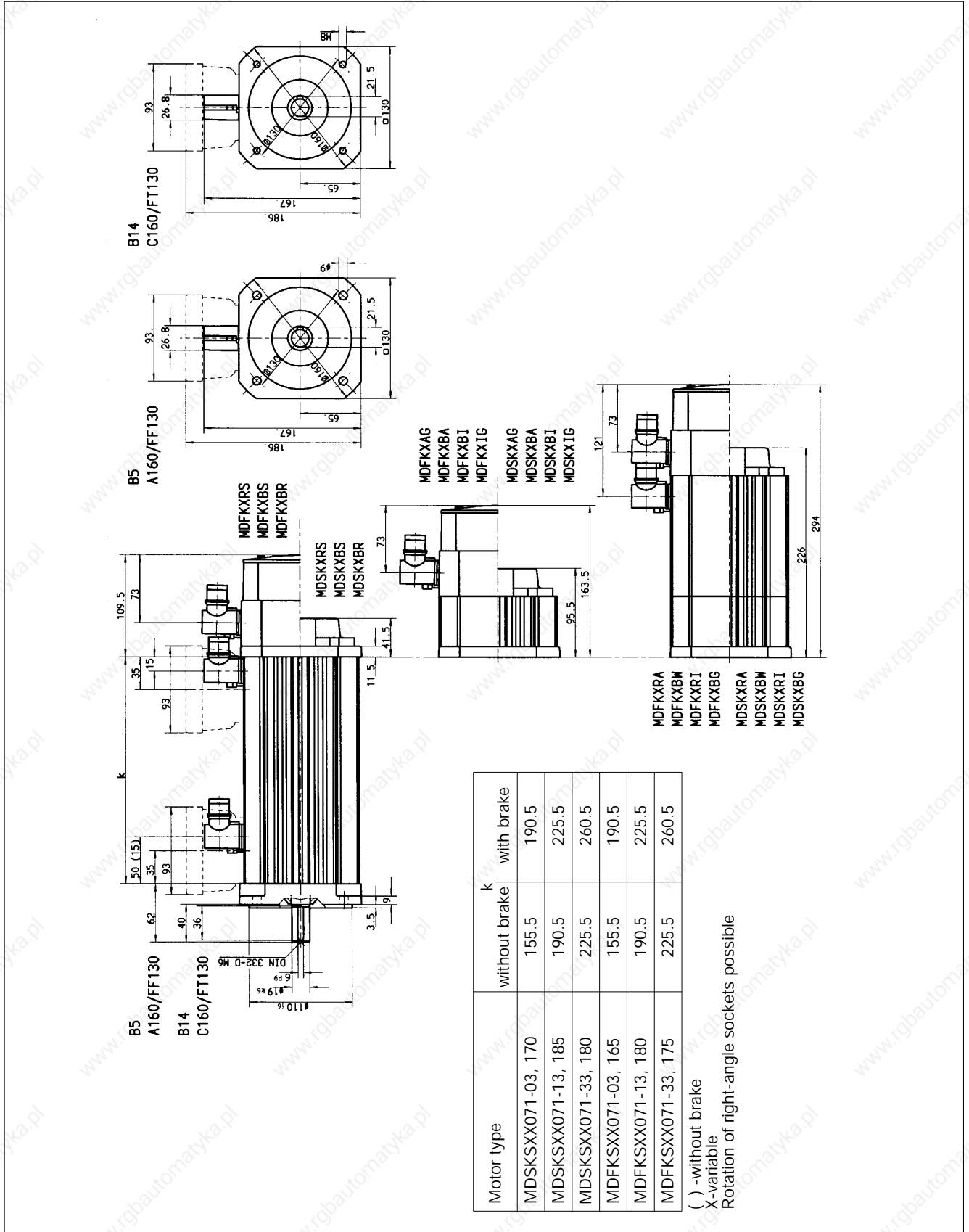
Dimensions

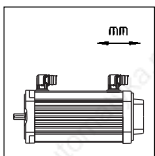
Synchronous servo motors MDSKS 056, mounting position B5/B14





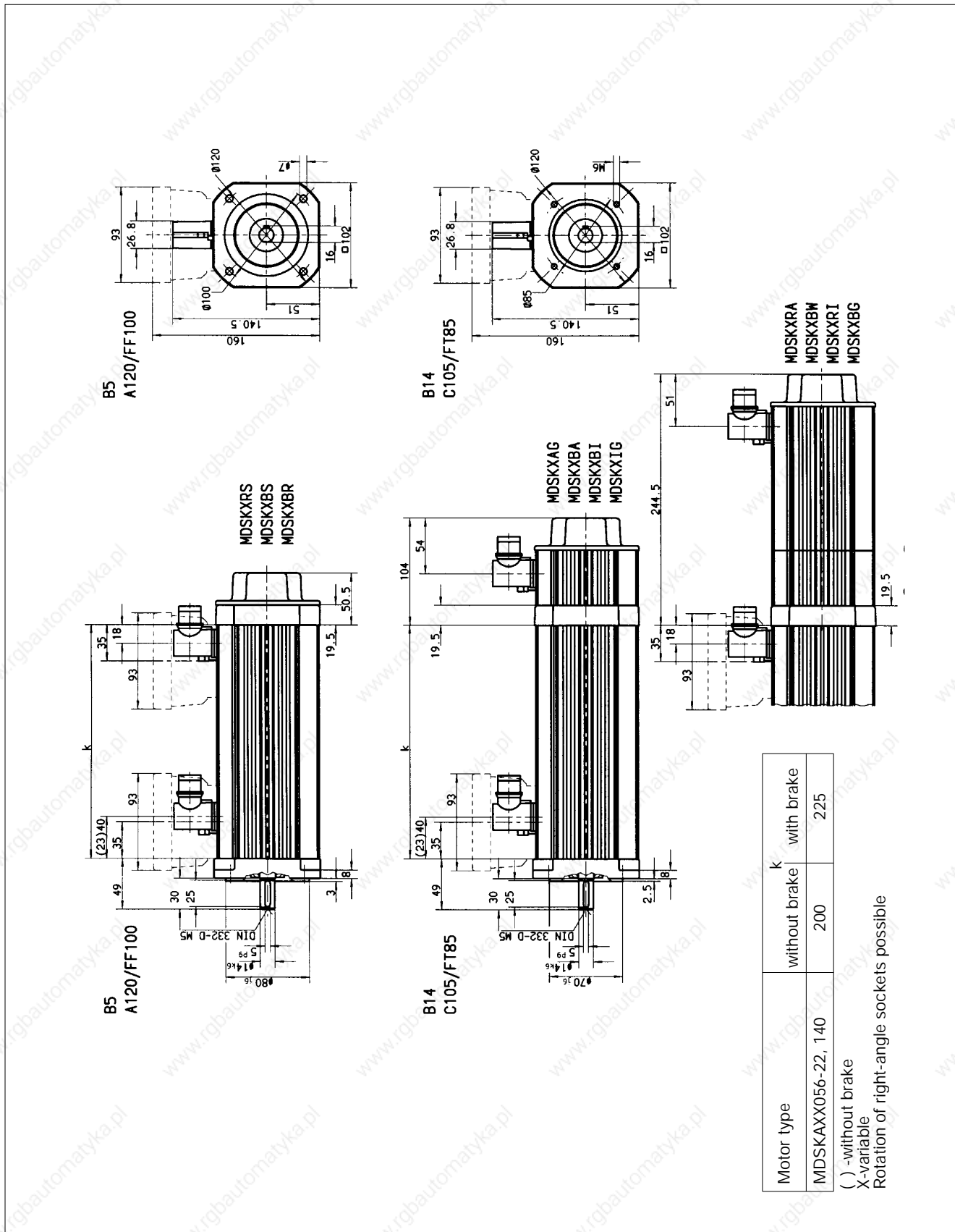
Synchronous servo motors MDXKS 071, mounting position B5/B14



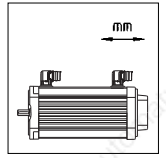


Dimensions

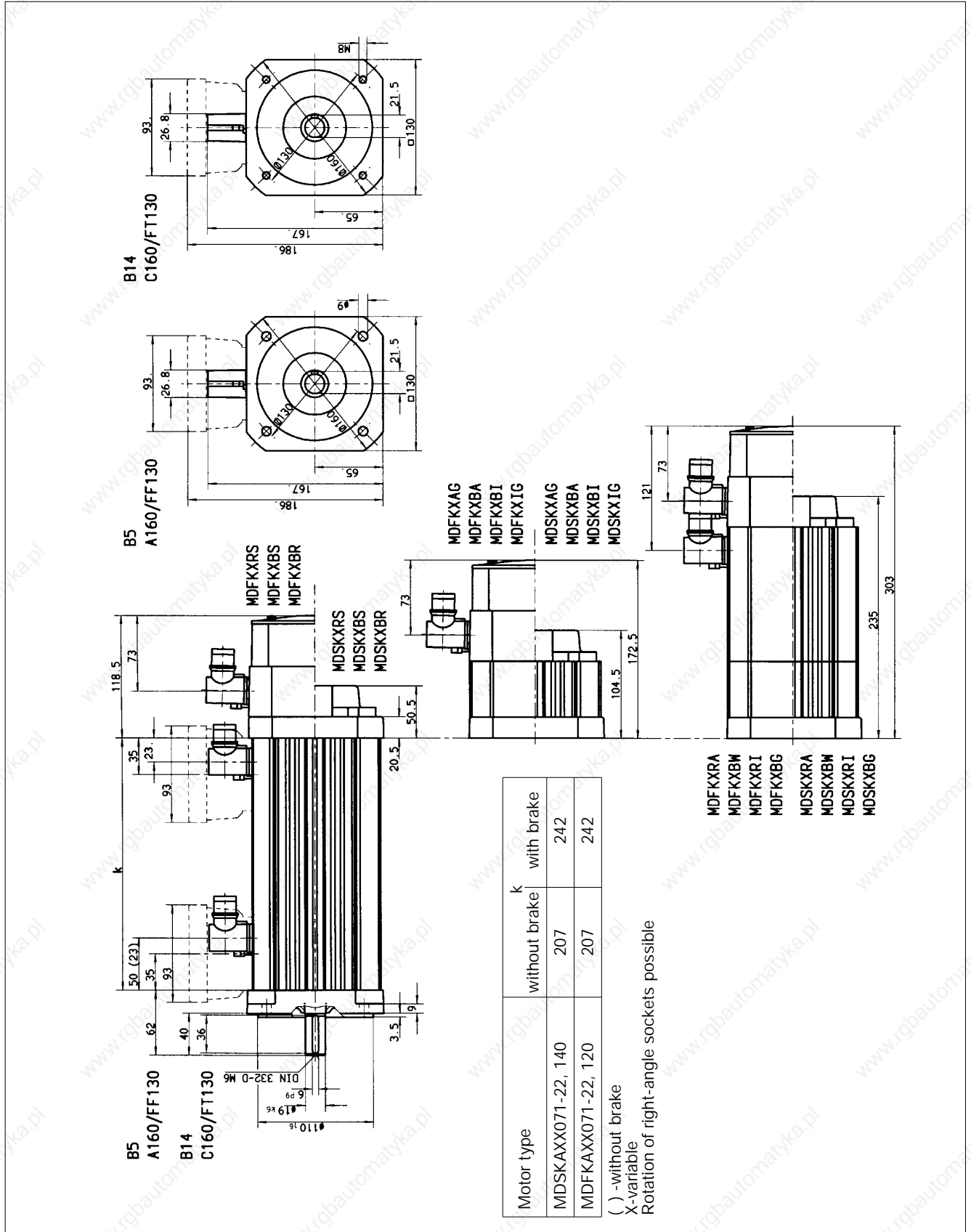
Asynchronous servo motors MDSKA 056, mounting position B5/B14

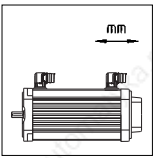


Dimensions



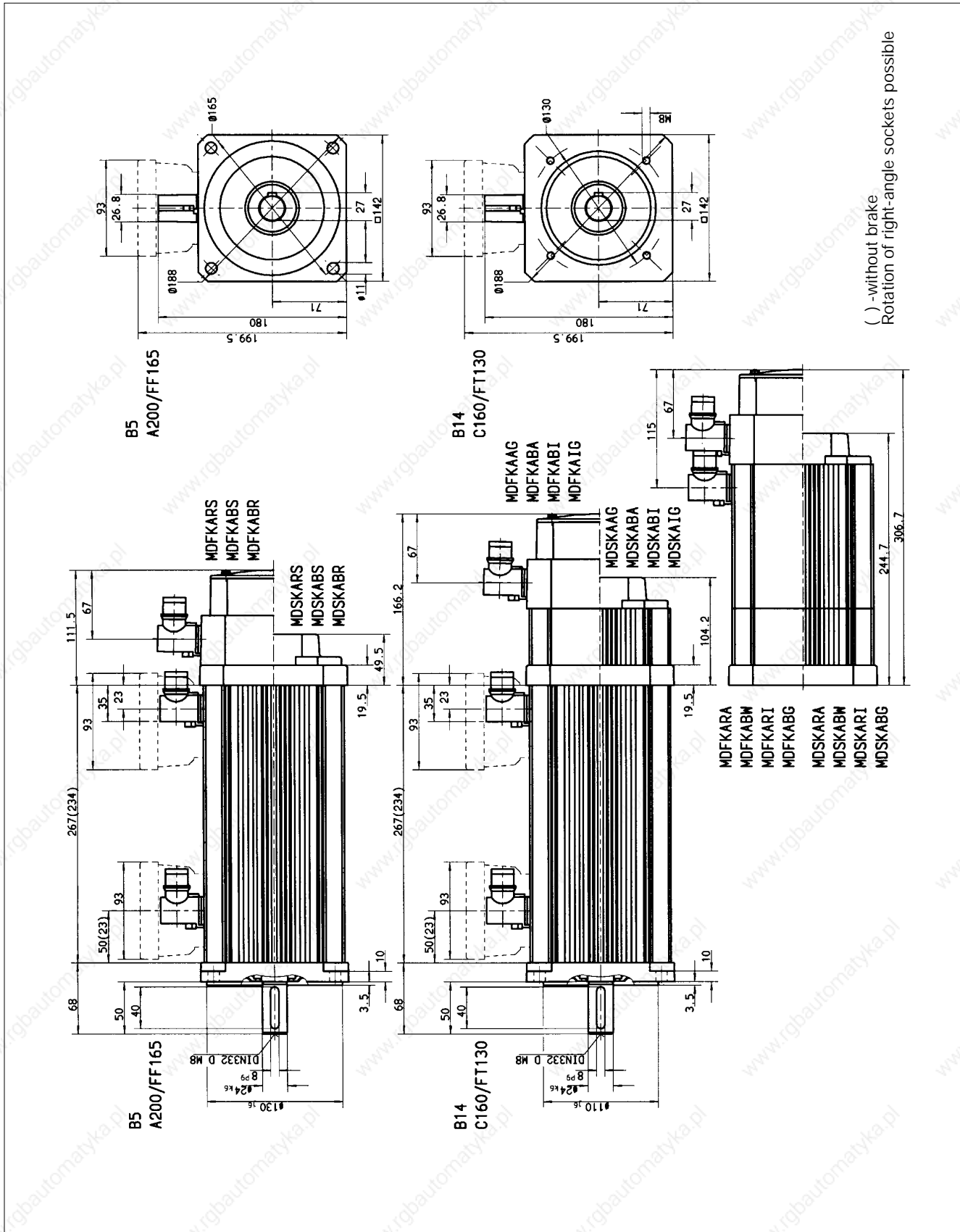
Asynchronous servo motors MDXKS 071, mounting position B5/B14



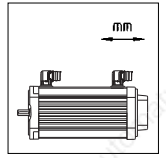


Dimensions

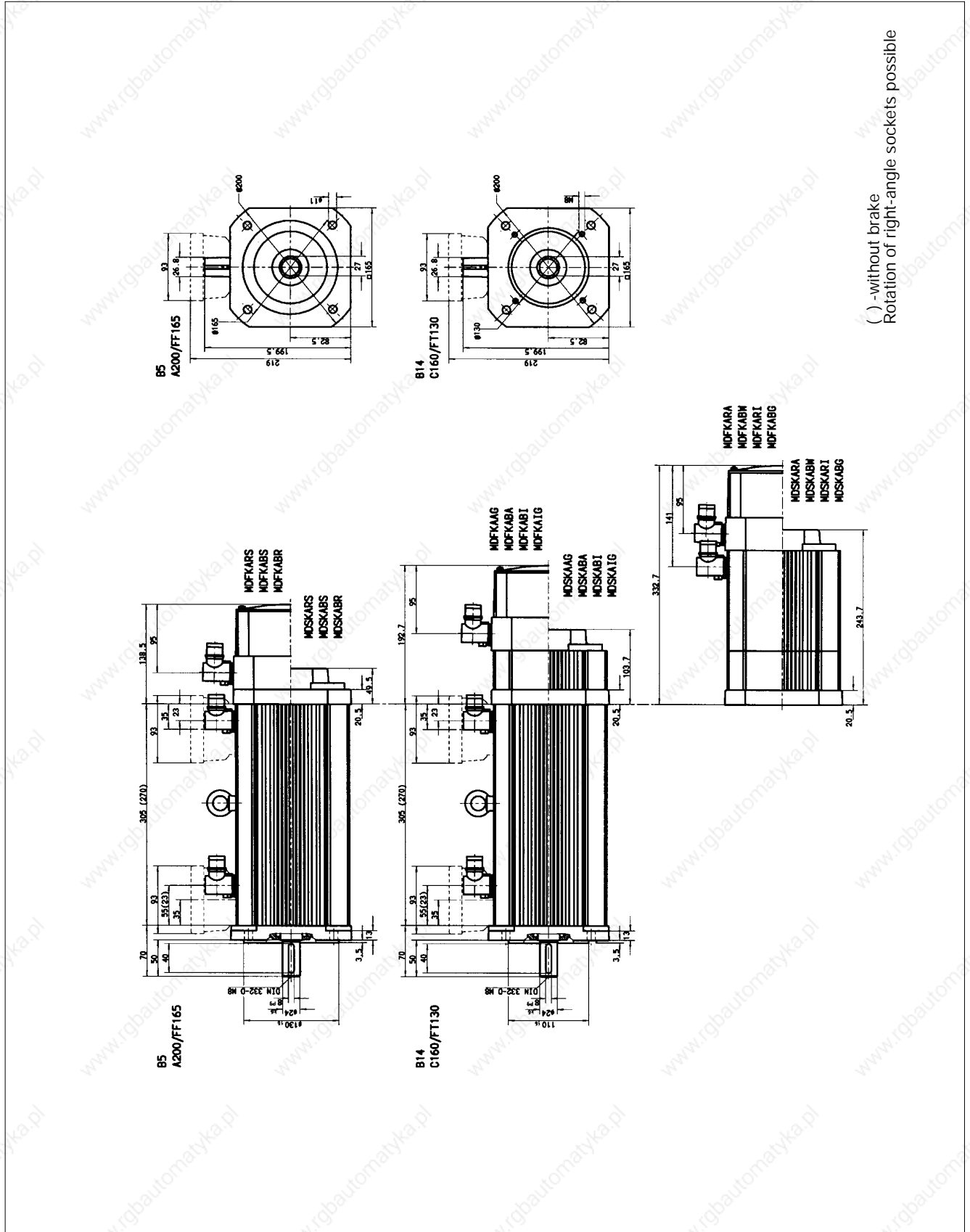
Asynchronous servo motors MDXKA 080, mounting position B5/B14

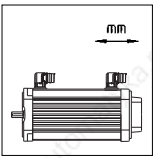


() - without brake
Rotation of right-angle sockets possible



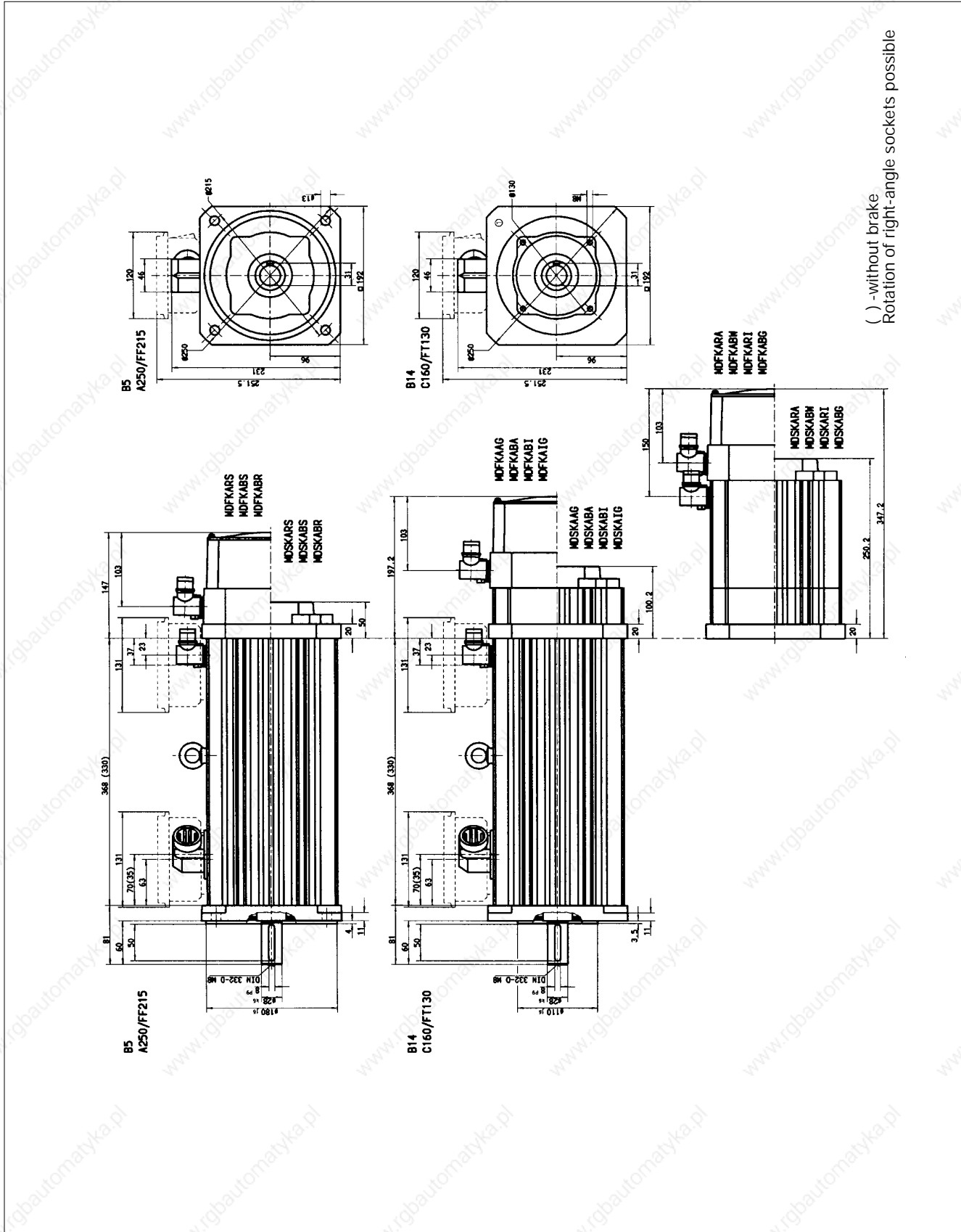
Asynchronous servo motors MDXKA 090, mounting position B5/B14



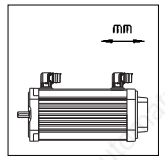


Dimensions

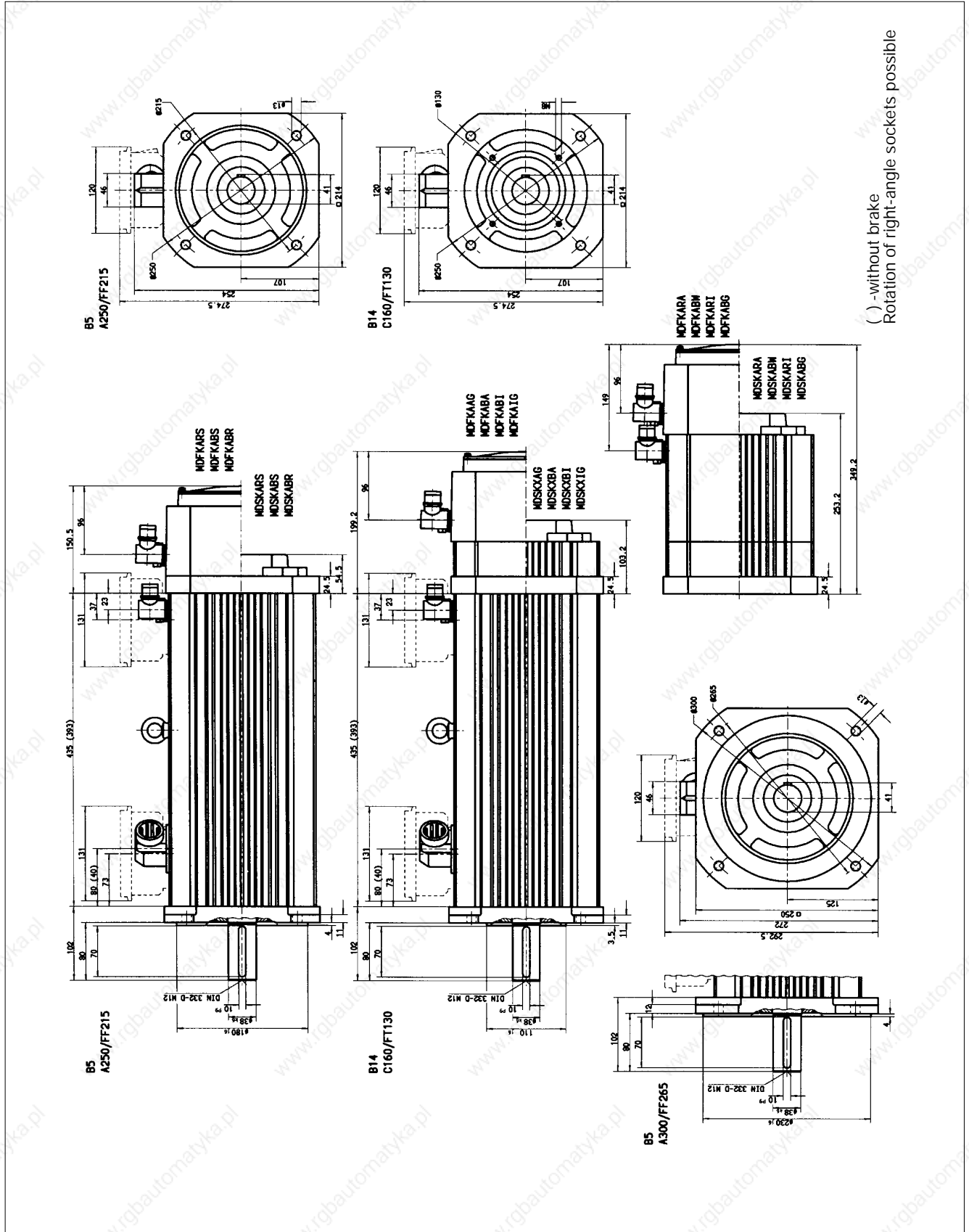
Asynchronous servo motors MDXKA 100, mounting position B5/B14

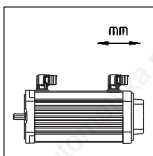


Dimensions



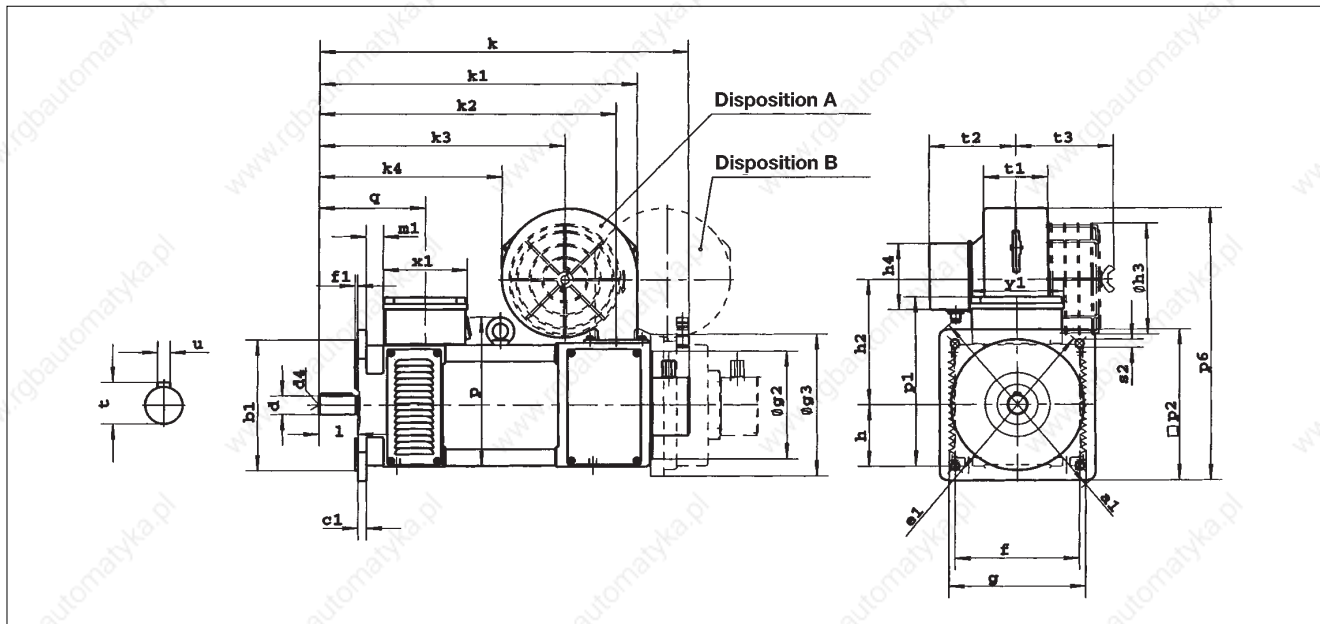
Asynchronous servo motors MDXKA 112, mounting position B5/B14





Dimensions

Asynchronous servo motors MDFQA 100...132, mounting position B5



| Motor type | Flange to DIN 42948 | Flange to IEC 72 | a1 P | b1 N | c HA | c1 LA | e1 M | f AB | f1 T | g AC | g2 - | h H | k2 - | m1 - | p - | p1 - | p2 - | q - |
|--------------|---------------------|------------------|---------|---------|---------|----------|---------|---------|---------|---------|---------|--------|---------|---------|--------|---------|---------|--------|
| MDFQA 100-22 | A300 | FF265 | 300 | 230 | 14 | 12 | 265 | 196 | 4 | 212 | 163 | 100 | 452 | 25 | 243 | 282 | 220 | 181 |
| MDFQA 132-32 | A400 | FF350 | 400 | 300 | 18 | 20 | 350 | 260 | 5 | 275 | 238 | 132 | 673 | 25 | 315 | 353 | 320 | 257 |

| Motor type | s2 S | x1 - | y1 - | d D | l E | t GA | u F | d4 - | h2 - | h3 - | h4 - | k1 - | k3 - | k4 - | p6 - | t1 - | t2 - | t3 - | Separate fan |
|--------------|---------|---------|---------|--------|--------|---------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| MDFQA 100-22 | 14 | 134 | 131 | 38 | 80 | 41 | 10 | M12 | 180 | - | 94 | 480 | 386 | 304 | 385 | 82 | 111 | 124 | G2D 120 |
| | 14 | 134 | 131 | 38 | 80 | 41 | 10 | M12 | 214 | 185 | 94 | 489 | 348 | 240 | 447 | 100 | 97 | 142 | G2D 140 |
| | 14 | 134 | 131 | 38 | 80 | 41 | 10 | M12 | 204 | 187 | 110 | 487 | 367 | 275 | 421 | 52 | 158 | 64 | DNG 3-4.5 |
| MDFQA 132-32 | 18 | 261 | 160 | 55 | 110 | 59 | 16 | M20 | 250 | - | 94 | 730 | 572 | 450 | 553 | 92 | 113 | - | G2D 180 |
| | 18 | 261 | 160 | 55 | 110 | 59 | 16 | M20 | 280 | 285 | 140 | 708 | 549 | 413 | 566 | 87 | 255 | 73 | DNG 8-12 |

Dimensions k

| Motor type | Encoder | | |
|--------------|---------|----------|--------|
| | without | Resolver | ITD 21 |
| MDFQA 100-22 | 540 | 572 | 572 |
| MDFQA 132-32 | 790 | 822 | 822 |

Dimensions k

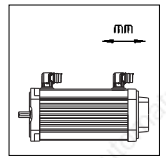
| Motor type | Brake 14.450 | | | | | |
|-----------------|--------------|-----|-----|-----|----------|--------|
| | 16 | 18 | 20 | 25 | Resolver | ITD 21 |
| MDFQA 100-22 | 666 | 666 | - | - | 696 | 696 |
| MDFQA 132-32 | - | - | 901 | 901 | 933 | 933 |
| MDFQA 100-132 * | 214 | 243 | 278 | 330 | - | - |

* = Dimension g3 (outer brake diameter)

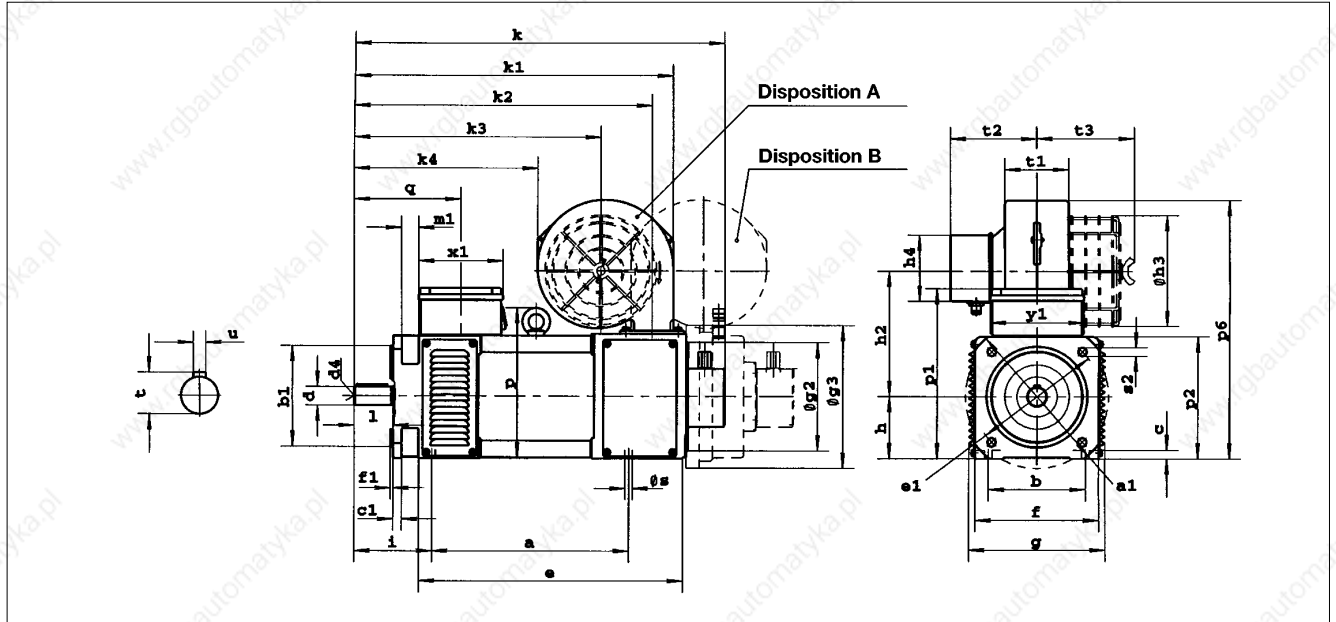
Terminal box at top (standard)
Shaft end fits to DIN 748T3

Key to DIN 6885, p. 1
Designations to DIN (a, b, c...), IEC (B, A, HA...)

Dimensions



Asynchronous servo motors MDFQA 100...132, mounting position B35



| Motor type | Flange to DIN 42948 | Flange to IEC 72 | a B | a1 P | b A | b1 N | c HA | c1 LA | e BB | e1 M | f AB | f1 T | g AC | g2 - | h H | i - | k2 - | m1 - | p - | p1 - | p2 - |
|--------------|------------------------|---------------------|--------|---------|--------|---------|---------|----------|---------|---------|---------|---------|---------|---------|--------|--------|---------|---------|--------|---------|---------|
| MDFQA 100-22 | A250 | FF215 | 295 | 250 | 160 | 180 | 14 | 12 | 382 | 215 | 196 | 4 | 212 | 163 | 100 | 143 | 452 | 25 | 243 | 270 | 198 |
| MDFQA 112-22 | A300 | FF265 | 385 | 300 | 190 | 230 | 16 | 12 | 504 | 265 | 220 | 4 | 235 | 198 | 112 | 150 | 555 | 25 | 267 | 297 | 222 |
| MDFQA 132-32 | A300 | FF265 | 460 | 300 | 215 | 230 | 18 | 12 | 604 | 265 | 260 | 4 | 275 | 238 | 132 | 199 | 673 | 25 | 315 | 353 | 262 |

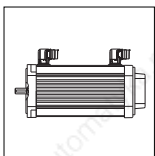
| Motor type | q - | s K | s2 S | x1 - | y1 - | d D | l E | t GA | u F | d4 - | h2 - | h3 - | h4 - | k1 - | k3 - | k4 - | p6 - | t1 - | t2 - | t3 - | Separate fan |
|--------------|--------|--------|---------|---------|---------|--------|--------|---------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-------------------------------------|
| MDFQA 100-22 | 181 | 12 | 14 | 134 | 131 | 38 | 80 | 41 | 10 | M12 | 180 | - | 94 | - | 386 | 304 | 375 | 82 | 111 | - | G2D 120 |
| | 181 | 12 | 14 | 134 | 131 | 38 | 80 | 41 | 10 | M12 | 214 | 185 | 94 | 489 | 240 | 437 | 100 | 97 | 97 | 142 | G2D 140 filter |
| | 181 | 12 | 14 | 134 | 131 | 38 | 80 | 41 | 10 | M12 | 204 | 187 | 110 | 487 | 367 | 275 | 411 | 52 | 158 | 64 | DNG 3-4.5 wide range |
| MDFQA 112-22 | 168 | 12 | 14 | 157 | 155 | 38 | 80 | 41 | 10 | M12 | 213 | 185 | 94 | 602 | 461 | 354 | 451 | 100 | 97 | 141 | G2D 160 |
| | 168 | 12 | 14 | 157 | 155 | 38 | 80 | 41 | 10 | M12 | 224 | 237 | q123 | 590 | 430 | 322 | 466 | 87 | 234 | 96 | DNG 5-12.5 Filter and wide range |
| MDFQA 132-32 | 257 | 15 | 18 | 261 | 160 | 55 | 110 | 59 | 16 | M20 | 250 | - | 94 | 730 | 572 | 450 | 525 | 92 | 113 | - | G2D 180 |
| | 257 | 15 | 18 | 261 | 160 | 55 | 110 | 59 | 16 | M20 | 280 | 285 | 140 | 708 | 549 | 413 | 558 | 87 | 255 | 73 | DNG 8-12 Filter and wide range |

Dimensions k

| Motor type | Encoder | | |
|--------------|---------|----------|--------|
| | without | Resolver | ITD 21 |
| MDFQA 100-22 | 540 | 572 | 572 |
| MDFQA 112-22 | 660 | 692 | 692 |
| MDFQA 132-32 | 790 | 822 | 822 |

| Motor type | Brake 14.450 | | | | | |
|-----------------|--------------|-----|-----|-----|----------|--------|
| | 16 | 18 | 20 | 25 | Resolver | ITD 21 |
| MDFQA 100-22 | 666 | 666 | - | - | 698 | 698 |
| MDFQA 112-22 | - | 786 | 786 | - | 818 | 818 |
| MDFQA 132-32 | - | - | 931 | 931 | 963 | 963 |
| MDFQA 100-132 * | 214 | 243 | 278 | 330 | - | - |

* = Dimension g3 (outer brake diameter)



Selection

Selection of a servo drive

Basic data

When installing a servo drive, normally a dynamic operation is required.

The essential data for the appropriate size of the motor are the following:

- Maximum torque M_{max} , Maximum speed n_{max} , efficient torque M_{eff} and if necessary transmission i

a) **Transmission:**
– for **perfect dynamic response**

b) – for a good use while **continuous operation**

$$i \approx \sqrt{\frac{J_{load}}{J_{motor}}}$$

$$i \approx \frac{n_{rated}}{n_{load}}$$

Efficient torque:

$$M_{rms} = \sqrt{\frac{1}{T} \sum_i M_i^2 t_i}$$

Maximum torque:

$$M_{max} = M_{accel} + \frac{1}{i} \frac{1}{\eta_{gearbox}} M_{load}$$

$$M_{accel} = 2 \cdot \pi \frac{\Delta n}{\Delta t} (J_{motor} + \frac{1}{i^2} J_{load})$$

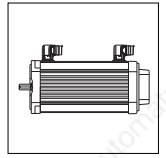
Selection of the motor

After having detected the technical data one may choose between synchronous and asynchronous motors, on the one hand and, on the other hand, between self ventilated

and forced ventilated motors. The main characteristics of the different motor types are listed below:

Select motor according to $M_{rated} > M_{rms}$ and $n_{max} > M_{max}$ and take into consideration:

- **no stream** of air allowed → Motor without fan MDSK
- **fluffs** or something similar, that might block the air channels → Motor without fan MDSK
- **high enclosure** required → Motor without fan MDSK
- **high dynamic response** required → Motor with fan MDFK,
→ Synchr. servo motor MDXKS
- operation with **constant power** with high speed (operation with weak field) → Asynchr. servo motor MDXKA
- very high **power density** → Synchr. servo motor MDXKS
→ enclosed ventilated asynchr. motors MDFQA
- **parallel operation** of servo mot. with one single inverter → Asynchr. servo motor MDXKA, MDFQA



Selection of a servo drive

Operational mode: acceleration

Selecting the size of the drives according to the limit characteristics.

- Low noise
- Check permanent current

If you select the drive according to n_{max} and M_{max} , the following has to be taken into account:

- selection of 16 kHz chopp. fre.
- especially with accelerating drive ($I_{max} > 1.5 I_{rated\ inverter}$)

$$I_{perm} > I_{medium} = \frac{1}{T_i} \sum I_{rated\ motor} \cdot \frac{M_i \cdot t_i}{M_{rated}}$$

with synchr. motors

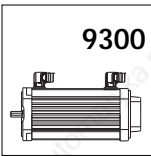
The mean is always below net value.

In the case of the continuous operation S6 and $M_{efficient} < M_{rated}$ the current medium value I_{medium} is smaller than the permanent current of the installation.

The following data are important for the operational mode acceleration drive:

Permanent current $\approx 0.7 \cdot I_{rated\ inverter}$

Maximum current $\approx 2 \cdot I_{rated\ inverter}$



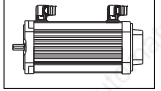
9300

Selection

Possible combinations with controllers

Motor-inverter combination servo motor – servo inverter series 9300, 16 kHz chopper frequency

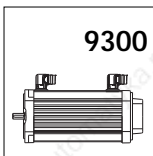
| | | | | | Possible combinations and standard setting $I_{max} = 1.5 I_n$, maximum torque in Nm | | | | | | | | | | Possible combinations and operational mode acceleration controller Maximum torque in Nm Chopper frequency $f_{chopp} = 8 \text{ KHz}$ | | | | | |
|----------------------------------|--------|-------------------------|-----------------|------------------|---|------|------|------|------|-------|------|------|------|-------|---|-------|------|------|------|------|
| | | | | | Chopper frequency $f_{chopp} = 8 \text{ KHz}$ | | | | | | | | | | | | | | | |
| Inverter type | | | | | 9321 | 9322 | 9323 | 9324 | 9325 | 9326 | 9327 | 9328 | 9329 | 9330 | 9331 | 9332 | 9321 | 9322 | 9323 | 9324 |
| Continuous current [A] | | | | | 1.5 | 2.5 | 3.9 | 7.0 | 13 | 23.5 | 32 | 47 | 59 | 89 | 110 | 145 | 1.05 | 1.7 | 2.6 | 4.7 |
| Maximum current [A] | | | | | 2.3 | 3.8 | 5.9 | 10.5 | 19.5 | 35.25 | 48 | 70.5 | 88.5 | 133.5 | 165 | 217.5 | 3 | 5 | 7.8 | 14 |
| Motor type | h [mm] | M_{rated}^{3000} [Nm] | I_{rated} [A] | M_{rated} [Nm] | | | | | | | | | | | | | | | | |
| Synchr. servo motors without fan | | | | | | | | | | | | | | | | | | | | |
| MDSKS 036-13, 200 | 35 | | 0.9 | 0.6 | 1.5 | 2.2 | | | | | | | | | | | 1.9 | | | |
| MDSKS 036-23, 200 | 35 | | 1.1 | 1.3 | 2.7 | 4.3 | 5.6 | | | | | | | | | | 3.5 | 5.0 | | |
| MDSKS 056-23, 190 | 51 | 2.9 | 2.3 | 2.8 | 2.8 | 4.6 | 7.0 | | | | | | | | | | 3.7 | 6.0 | 9.2 | |
| MDSKS 036-33, 200 | 51 | 4.3 | 3.6 | 4.2 | | 4.4 | 6.9 | 11.7 | | | | | | | | | 5.8 | 9.0 | 15.2 | |
| MDSKS 071-03, 170 | 65 | 5.9 | 4.2 | 5.7 | | | 8.0 | 13.8 | 23.6 | | | | | | | | | 10.6 | 17.8 | |
| MDSKS 071-13, 185 | 65 | 8.8 | 7 | 8.3 | | | 7.0 | 12.5 | 22.3 | 35.2 | | | | | | | | 9.2 | 16.6 | |
| MDSKS 071-33, 180 | 65 | 13 | 10 | 12.3 | | | | 12.9 | 24.0 | 41.4 | | | | | | | | | 17.2 | |
| with separate fan | | | | | | | | | | | | | | | | | | | | |
| MDFKS 071-03, 165 | 65 | 7.7 | 5.6 | 7.5 | | | 8.0 | 13.8 | 23.5 | | | | | | | | | 10.6 | 17.8 | |
| MDFKS 071-13, 180 | 65 | 11.7 | 9.2 | 11.0 | | | | 12.5 | 21.8 | 35.2 | | | | | | | | | 16.6 | |
| MDFKS 071-33, 175 | 65 | 17 | 13.1 | 16.2 | | | | 12.9 | 24.0 | 41.4 | | | | | | | | | 17.2 | |



Possible combinations with controllers

Motor-inverter combination servo motor – servo inverter series 9300, 8 kHz chopper frequency

| | | | | | | | | Possible combinations and maximum torque in Nm | | | | | | | | | | | |
|---|--------|------------------------|------------------|-----------------|-----------------|------------------|--|--|------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| | | Inverter type | | | | | | Chopper frequency $f_{chopp} = 8 \text{ KHz}$ | | | | | | | | | | | |
| | | Continuous current [A] | | | | | | 9321 | 9322 | 9323 | 9324 | 9325 | 9326 | 9327 | 9328 | 9329 | 9330 | 9331 | 9332 |
| | | Maximum current [A] | | | | | | 1.5 | 2.5 | 3.9 | 7.0 | 13 | 23.5 | 32 | 47 | 59 | 89 | 110 | 145 |
| | | | | | | | | 2.3 | 3.8 | 5.9 | 10.5 | 19.5 | 35.3 | 48 | 70.5 | 88.5 | 133.5 | 165 | 217.5 |
| Motor type | h [mm] | M_{rated} [Nm] | P_{rated} [kW] | I_{rated} [A] | I_{max}^1 [A] | f_{rated} [Hz] | | | | | | | | | | | | | |
| Asynchronous servo motors surface cooled | | | | | | | | | | | | | | | | | | | |
| without fan | | | | | | | | | | | | | | | | | | | |
| MDSKA 056-22, 140 | 51 | 2.0 | 0.8 | 2.4 | | 140 | | 4.45 | 7.3 | 9.8 | | | | | | | | | |
| MDSKA 071-22, 140 | 65 | 4.0 | 1.7 | 4.4 | | 140 | | | | 12.6 | 19.5 | | | | | | | | |
| MDSKA 080-22, 70 | 71 | 6.7 | 1.4 | 3.3 | | 70 | | | 15.1 | 29.3 | | | | | | | | | |
| MDSKA 080-22, 140 | 71 | 5.4 | 2.3 | 5.8 | | 140 | | | | 13.2 | 26.0 | | | | | | | | |
| MDSKA 090-22, 80 | 83 | 10.8 | 2.6 | 5.5 | | 80 | | | | 24.4 | 46.2 | | | | | | | | |
| MDSKA 090-22, 140 | 83 | 9.5 | 4.1 | 10.2 | | 140 | | | | 23.4 | 43.7 | 59.4 | | | | | | | |
| MDSKA 100-22, 80 | 96 | 16.3 | 4.0 | 8.2 | | 80 | | | | 47.2 | 88.2 | | | | | | | | |
| MDSKA 100-22, 140 | 96 | 12.0 | 5.2 | 14.0 | | 140 | | | | 20.7 | 43.3 | 60.7 | | | | | | | |
| MDSKA 112-22, 85 | 107 | 24.6 | 6.4 | 13.5 | | 85 | | | | 46.2 | 78.0 | 92.4 | | | | | | | |
| MDSKA 112-22, 140 | 107 | 17.0 | 7.4 | 19.8 | | 140 | | | | 43.9 | 63.3 | 96.8 | 123.0 | | | | | | |
| with separate fan | | | | | | | | | | | | | | | | | | | |
| MDFKA 071-22, 120 | 65 | 6.3 | 2.2 | 6.0 | | 120 | | | | 13.0 | 25.0 | | | | | | | | |
| MDFKA 080-22, 60 | 71 | 12.0 | 2.1 | 4.8 | | 60 | | | | 29.6 | 45.2 | | | | | | | | |
| MDFKA 080-22, 120 | 71 | 10.8 | 3.9 | 9.1 | | 120 | | | | 29.3 | 53.8 | | | | | | | | |
| MDFKA 090-22, 60 | 83 | 21.5 | 3.8 | 8.5 | | 60 | | | | 57.2 | 86.7 | | | | | | | | |
| MDFKA 090-22, 120 | 83 | 19.0 | 6.9 | 15.8 | | 120 | | | | 50.7 | 69.2 | 100.2 | | | | | | | |
| MDFKA 100-22, 60 | 96 | 36.3 | 6.4 | 13.9 | | 60 | | | | 50.1 | 95.9 | 130.8 | | | | | | | |
| MDFKA 100-22, 120 | 96 | 36.0 | 13.2 | 28.7 | | 120 | | | | 45.7 | 67.6 | 104.3 | 132.9 | 202.0 | | | | | |
| MDFKA 112-22, 60 | 107 | 61.4 | 11.0 | 22.5 | | 60 | | | | 104.1 | 143.3 | 211.0 | 257.0 | | | | | | |
| MDFKA 112-22, 120 | 107 | 55.0 | 20.3 | 42.5 | | 120 | | | | 107.7 | 135.9 | 205.0 | 250.0 | | | | | | |
| Asynchronous servo motors. enclosed ventilated | | | | | | | | | | | | | | | | | | | |
| MDFQA 100-22, 50 | 100 | λ | 71.3 | 10.6 | 26.5 | 50 | | | | 109.3 | 156.7 | 232.0 | 253.0 | | | | | | |
| MDFQA 100-22, 100 | 100 | λ | 66.2 | 20.3 | 46.9 | 100 | | | | | | 112.5 | 146.4 | 227.0 | 257.0 | | | | |
| MDFQA 112-22, 50 | 112 | λ | 145 | 11.5 | 27.2 | 28 | | | | | 247.0 | 339.0 | 346.0 | | | | | | |
| MDFQA 112-22, 50 | 112 | Δ | 135 | 20.1 | 43.7 | 50 | | | | | | 230.1 | 292.9 | 341.8 | | | | | |
| MDFQA 112-22, 100 | 112 | λ | 130 | 22.7 | 49.1 | 58 | | | | | | 180.5 | 228.0 | 342.0 | 378.0 | | | | |
| MDFQA 112-22, 100 | 112 | Δ | 125 | 38.4 | 81.9 | 100 | | | | | | | | 216.0 | 273.0 | 355.0 | | | |
| MDFQA 132-32, 36 | 132 | λ | 296 | 17.0 | 45.2 | 20 | | | | | | 482.0 | 612.0 | 751.0 | | | | | |
| MDFQA 132-32, 36 | 132 | Δ | 288 | 31.1 | 77.4 | 36 | | | | | | | | 552.0 | 671.0 | | | | |
| MDFQA 132-32, 76 | 132 | λ | 282 | 35.4 | 88.8 | 42 | | | | | | | | 424.0 | 512.0 | 663.0 | | | |
| MDFQA 132-32, 76 | 132 | Δ | 257 | 60.1 | 144.8 | 76 | | | | | | | | | 344.0 | 458.0 | | | |



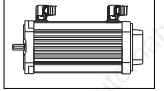
9300

Selection

Possible combinations with controllers

Motor-inverter combination servo motor – servo inverter series 9300, 16 kHz chopper frequency (low noise)

| | | | | Possible combinations and standard setting $I_{max} = 1.5 I_n$ Maximum torque in Nm | | | | | | Possible combinations and controller for the operational mode acceleration Maximum torque in Nm | | | | |
|--------------------------------------|--------|-----------------|------------------|--|------|------|------|------|------|--|------|------|------|------|
| | | | | Chopper frequency f_{chopp} $f_{chopp} = 16 \text{ KHz}$ | | | | | | Chopper frequency $f_{chopp} = 16 \text{ KHz}$ | | | | |
| Inverter type | | | | 9321 | 9322 | 9323 | 9324 | 9325 | 9326 | 9327 | 9321 | 9322 | 9323 | 9324 |
| Continuous current [A] | | | | 1.1 | 1.8 | 2.9 | 5.2 | 9.7 | 15.3 | 20.8 | 0.77 | 1.26 | 2.03 | 3.64 |
| Maximum current [A] | | | | 2.7 | 2.7 | 4.4 | 7.8 | 14.6 | 23 | 31.2 | 2.2 | 3.6 | 5.8 | 10.4 |
| Motor type | h [mm] | I_{rated} [A] | M_{rated} [Nm] | | | | | | | | | | | |
| Synchronous servo motors without fan | | | | | | | | | | | | | | |
| MDSKS 036-13, 200 | 35 | 0.9 | 0.6 | 1.1 | 1.7 | 2.4 | | | | | 1.4 | 2.1 | | |
| MDSKS 036-23, 200 | 35 | 1.1 | 1.3 | 2.0 | 3.2 | 4.7 | | | | | 2.6 | 4.0 | 5.5 | |
| MDSKS 056-23, 190 | 51 | 2.3 | 2.8 | 2.1 | 3.3 | 5.4 | 9.2 | | | | 2.7 | 4.4 | 6.9 | |
| MDSKS 036-33, 200 | 51 | 3.6 | 4.2 | | | 5.1 | 9.0 | 15.8 | | | | | 6.8 | 11.6 |
| MDSKS 071-03, 170 | 65 | 4.2 | 5.7 | | | 6.0 | 10.6 | 18.5 | | | | | 7.9 | 13.7 |
| MDSKS 071-13, 185 | 65 | 7 | 8.3 | | | | 9.2 | 17.2 | 25.9 | 34.4 | | | | 12.3 |
| MDSKS 071-33, 180 | 65 | 10 | 12.3 | | | | | 18.0 | 27.9 | 36.9 | | | | |
| with separate fan | | | | | | | | | | | | | | |
| MDFKS 071-03, 165 | 65 | 5.6 | 7.5 | | | | 10.6 | 18.5 | | | | | | 13.7 |
| MDFKS 071-13, 180 | 65 | 9.2 | 11.0 | | | | 9.2 | 17.2 | 25.9 | 34.4 | | | | 12.3 |
| MDFKS 071-33, 175 | 65 | 13.1 | 16.2 | | | | | 18.0 | 27.9 | 36.9 | | | | |

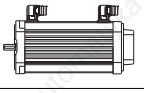


Possible combinations with controllers

Motor-inverter combination servo motor – servo inverter series 9300, 16 kHz chopper frequency (low noise)

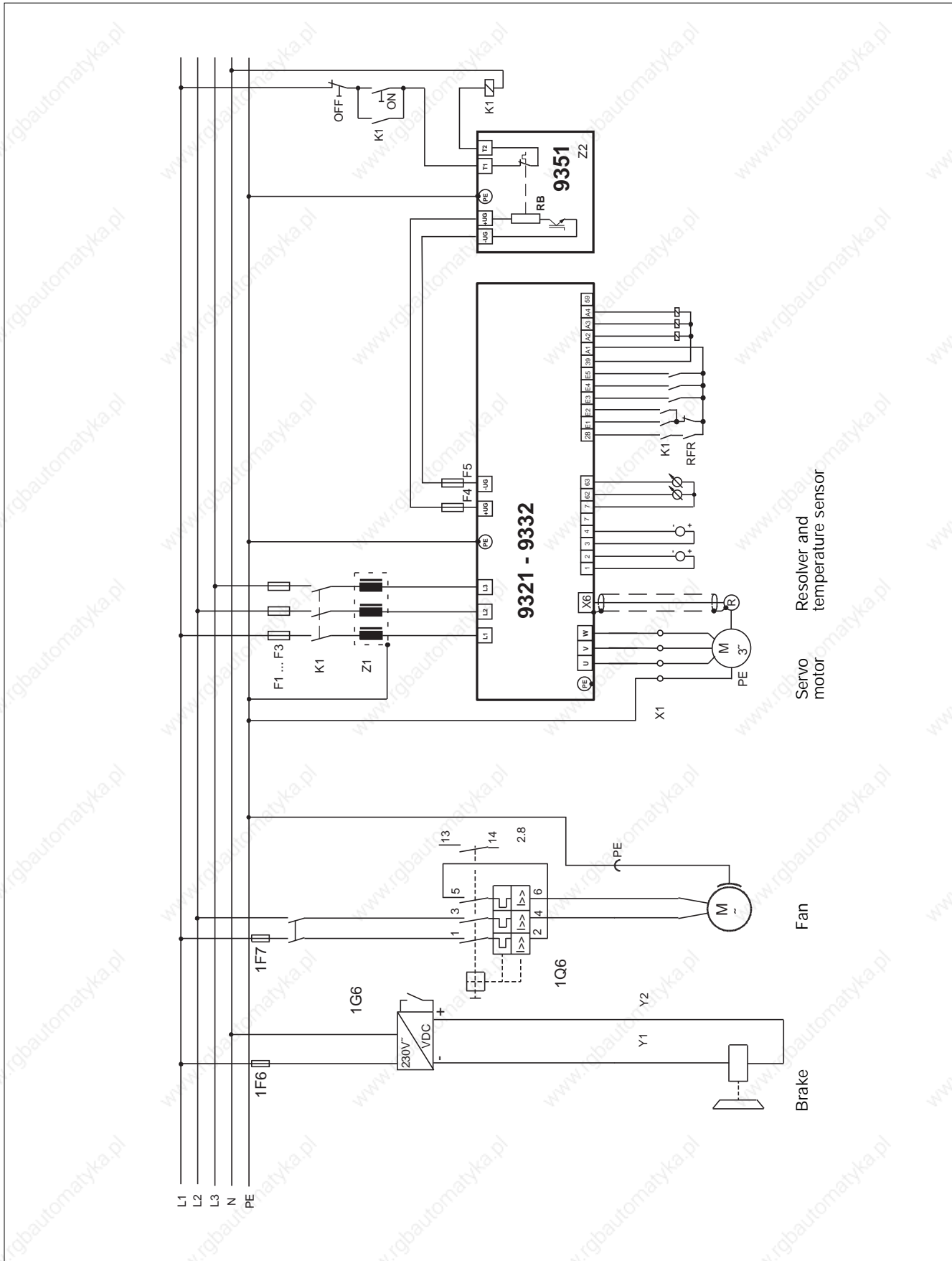
| | | | | Possible combinations and maximum torque in Nm | | | | | | | | | | | | |
|--|--------|------------------------|------------------|--|------------------|------|------|------|------|------|-------|-------|-------|-------|-------|--|
| | | Inverter type | | Chopper frequency $f_{chopp} = 16 \text{ KHz}$ | | | | | | | | | | | | |
| | | Continuous current [A] | | 9321 | 9322 | 9323 | 9324 | 9325 | 9326 | 9327 | 9328 | 9329 | 9330 | 9331 | 9332 | |
| | | Maximum current [A] | | 1.1 | 1.8 | 2.9 | 5.2 | 9.7 | 15.3 | 20.8 | 30.6 | 38 | 58 | 70 | 90 | |
| | | | | 1.7 | 2.7 | 4.4 | 7.8 | 14.6 | 23 | 31.2 | 45.9 | 57 | 87 | 105 | 135 | |
| Motor type | h [mm] | M_{rated} [Nm] | P_{rated} [kW] | I_{rated} [A] | f_{rated} [Hz] | | | | | | | | | | | |
| Asynchronous servo motors, surface cooled without fan | | | | | | | | | | | | | | | | |
| MDSKA 056-22, 140 | 51 | 2.0 | 0.8 | 2.4 | 140 | | | 5.3 | 9.2 | | | | | | | |
| MDSKA 071-22, 140 | 65 | 4.0 | 1.7 | 4.4 | 140 | | | | 9.2 | 17.3 | | | | | | |
| MDSKA 080-22, 70 | 71 | 6.7 | 1.4 | 3.3 | 70 | | | | 21.2 | 35.1 | | | | | | |
| MDSKA 080-22, 140 | 71 | 5.4 | 2.3 | 5.8 | 140 | | | | 9.1 | 19.1 | 30.8 | | | | | |
| MDSKA 090-22, 80 | 83 | 10.8 | 2.6 | 5.5 | 80 | | | | 17.5 | 34.5 | 50.0 | | | | | |
| MDSKA 090-22, 140 | 83 | 9.5 | 4.1 | 10.2 | 140 | | | | 16.9 | 28.0 | 38.6 | 56.9 | | | | |
| MDSKA 100-22, 80 | 96 | 16.3 | 4.0 | 8.2 | 80 | | | | 33.8 | 56.7 | 78.1 | | | | | |
| MDSKA 100-22, 140 | 96 | 12.0 | 5.2 | 14.0 | 140 | | | | 25.8 | 37.6 | 57.9 | | | | | |
| MDSKA 112-22, 85 | 107 | 24.6 | 6.4 | 13.5 | 85 | | | | 55.8 | 71.4 | 90.3 | 97.5 | | | | |
| MDSKA 112-22, 140 | 107 | 17.0 | 7.4 | 19.8 | 140 | | | | | 37.5 | 60.1 | 76.8 | 120.8 | | | |
| with separate fan | | | | | | | | | | | | | | | | |
| MDFKA 071-22, 120 | 65 | 6.3 | 2.2 | 6.0 | 120 | | | | 19.0 | 26.3 | | | | | | |
| MDFKA 080-22, 60 | 71 | 12.0 | 2.1 | 4.8 | 60 | | | | 21.5 | 41.3 | | | | | | |
| MDFKA 080-22, 120 | 71 | 10.8 | 3.9 | 9.1 | 120 | | | | 21.2 | 34.9 | 47.7 | | | | | |
| MDFKA 090-22, 60 | 83 | 21.5 | 3.8 | 8.5 | 60 | | | | 42.0 | 67.9 | 86.2 | | | | | |
| MDFKA 090-22, 120 | 83 | 19.0 | 6.9 | 15.8 | 120 | | | | | 44.6 | 66.1 | 81.7 | | | | |
| MDFKA 100-22, 60 | 96 | 36.3 | 6.4 | 13.9 | 60 | | | | 60.5 | 84.3 | 125.2 | 150.7 | | | | |
| MDFKA 100-22, 120 | 96 | 36.0 | 13.2 | 28.7 | 120 | | | | | | 64.0 | 75.4 | 130.5 | 158.3 | | |
| MDFKA 112-22, 60 | 107 | 61.4 | 11.0 | 22.5 | 60 | | | | | 91.2 | 136.9 | 170.4 | 254.0 | | | |
| MDFKA 112-22, 120 | 107 | 55.0 | 20.3 | 42.5 | 120 | | | | | | | | 133.6 | 161.1 | 206.0 | |
| Asynchronous servo motors, enclosed ventilated | | | | | | | | | | | | | | | | |
| MDFQA 100-22, 50 | 100 | λ | 71.3 | 10.6 | 26.5 | 50 | | | | | 149.0 | 189.2 | 250.0 | | | |
| MDFQA 100-22, 100 | 100 | λ | 66.2 | 20.3 | 46.9 | 100 | | | | | | | 143.6 | 175.2 | 227.2 | |
| MDFQA 112-22, 50 | 112 | λ | 145 | 11.5 | 27.2 | 28 | | | | | 236.0 | 292.0 | 346.0 | | | |
| MDFQA 112-22, 50 | 112 | Δ | 135 | 20.1 | 43.7 | 50 | | | | | | | 288.5 | 314.3 | | |
| MDFQA 112-22, 100 | 112 | λ | 130 | 22.7 | 49.1 | 58 | | | | | | | 224.0 | 269.0 | 343.0 | |
| MDFQA 112-22, 100 | 112 | Δ | 125 | 38.4 | 81.9 | 100 | | | | | | | | 159.4 | 217.0 | |
| MDFQA 132-32, 36 | 132 | λ | 296 | 17.0 | 45.2 | 20 | | | | | | | 605.0 | 681.0 | 753.0 | |
| MDFQA 132-32, 36 | 132 | Δ | 288 | 31.1 | 77.4 | 36 | | | | | | | | 440.0 | 556.0 | |
| MDFQA 132-32, 76 | 132 | λ | 282 | 35.4 | 88.8 | 42 | | | | | | | | | 428.0 | |
| MDFQA 132-32, 76 | 132 | Δ | 257 | 60.1 | 144.8 | 76 | | | | | | | | | | |

9300



Application examples

Connection diagram



EC-Declaration – Low-voltage Directive (73/23/EEC)

EC-Declaration of Conformity '96 for the purpose of the **EC Low-Voltage Directive (73/23/EEC)**

amended by: CE- mark directive (93/68/EEC)

The following products were developed, designed, and manufactured in compliance with the above-mentioned EC directive under the sole responsibility of
Lenze GmbH & Co KG, Postfach 10 13 52, D-31763 Hameln

Lenze

Electronic drives

Lenze GmbH & Co KG
Postfach 10 13 52
D-31763 Hameln

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Hans-Lenze-Straße 1
D-31855 Aerzen
Telephone (05154) 82-0
Telefax (05154) 82-26 11

Product:

DC motors

Asynchronous motors

Servo motors

Three-phase AC winder motors

Type:

MGFRK, MGFOU, MGFOK
MGERK, MGEQU, MGEOK
MGSRK, MGSQU, MGSOK
13.12 \circ , 13.53 \circ , 13.55 \circ
43.55 \circ

13.71 \circ , 13.74 \circ , 13.75 \circ
13.81 \circ , 13.84 \circ , 13.85 \circ
DFRA, DERA, DSRA
43.71 \circ , 43.75 \circ

DFVA, DSV A, MDFQA
MDFKA, MDSKA
MDFKS, MDSKS

\circ \circ L12, \circ \circ F12
 \circ \circ S8, \circ \circ S6
 \circ \circ S4, \circ \circ F4
 \circ \circ MF4, \circ \circ SF4
 \circ \circ LF4

Standards:

EN 60204-1, IEC 204-1
EN 60034, VDE 0530, IEC34

Declaration about EMC directive (89/336/EEC)

Asynchronous motors comply with the requirements of the EC directive „Electromagnetic Compatibility“ 89/336/EEC under consideration of the standards EN 80081-1 and EN 50082-2 when connected to a sinusoidal AC mains voltage.

For inverter or DC-controller operation, the EMC notes of the manufacturers must be observed.
When using screened motor cables, the screening is most effective with a conductive connection with as large an area as possible between the screen and the earth potential of the motor (e.g. metal cable gland).

Hameln, February 20, 1996



(i. V. Pankow)
Head of R & D Department