

# **TECNOTION<sup>®</sup>**

## **THE LINEAR MOTOR COMPANY**

*Frameless Torque Motor Series*

# QUALITY AND SERVICE DELIVERED WORLDWIDE

## [ TECNOTION ]

Tecnotion is *the* global authority on direct drive motor technology. We are the world's only unbundled manufacturer of linear and torque motors. A former part of Philips, we specialize solely in the development and production of linear and torque motors. Because of this, our expertise, customer service and product quality are unmatched.

We have a global presence, with production plants in The Netherlands and China and local representation around the world. This ensures short delivery times and high quality support, wherever you are located.

When you do business with Tecnotion, you have a team of highly skilled sales and application engineers at your disposal. They help you from your initial prototype all the way to the application of our products and beyond.

Whatever your needs, you can rely on Tecnotion as a solid, reliable partner.





## [ SALES SUPPORT ]

At Tecnotion we understand that each application of our motors is a unique case with specific requirements and demands.

Our sales and application engineers have extensive experience with a wide range of application types and collaborate on a high level with our customers to make sure you get the solution that best fits your requirements.

Additionally our specialized Simulation Tool is available to help you find your way through our wide range of motors and analyze/test out different motor types within your application specifications.

## [ INNOVATION ]

We have an in-house R&D department, which is continuously pushing the boundaries of technology and taking our products to the next level. This translates directly to our high level of understanding of manufacturing processes.

Apart from our "off-the-shelf" range of standard motors, we can also design and manufacture custom made motors for high profile projects or OEM applications that require a tailor-made solution.

All our custom motors are built to the same high standards that characterize our standard range of products.

## [ MANUFACTURING ]

Manufacturing of our standard range of motors takes place at our modern plant in China, where we are able to produce in high volume at very competitive rates.

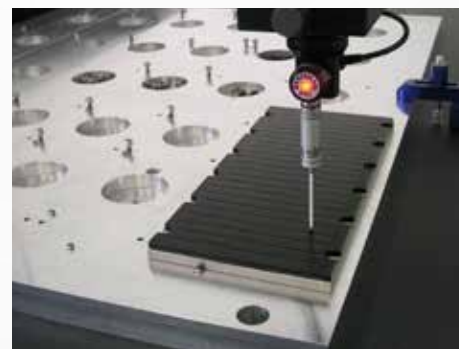
At our competence centre and headquarters in The Netherlands we specialize in advanced technology. This is where we do our research and development and where custom motors are built with extreme accuracy in our special state of the art clean room environment.

Tecnotion is committed to excellence. Both of our plants are ISO 9001 certified and comply to the highest quality standards possible.

## [ GLOBAL LOGISTICS ]

We always have our most popular products in stock in our warehouses in both The Netherlands and China.

Our logistics department can ship to you from both locations, making short delivery times possible across the globe, even when markets are ramping.



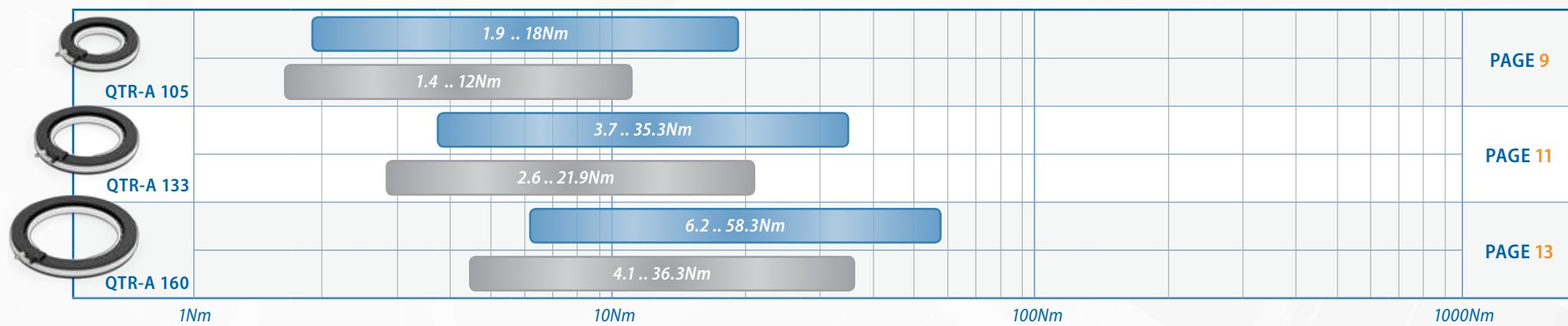
# Frameless torque motors

## Overview of the complete range

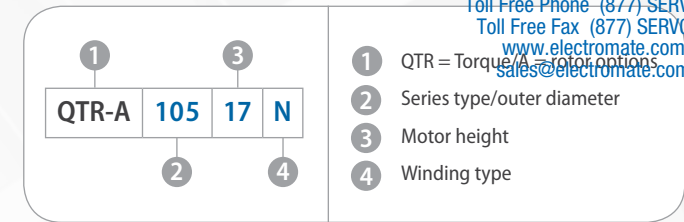


### Tecnotion's torque motor power range

■ Peak torque    ■ Continuous torque







### Why choose Tecnotion's Torque motor series?

Tecnotion's QTR torque motor series can find its way into many different markets, for example semiconductor, robotics, packaging, printing, machine tooling or medical application markets.

Due to the extensive motor design knowledge within Tecnotion, the QTR series are ahead in development. Compared to other torque motors, the QTR series offers a superior torque density and stands out with its small size and weight. The QTR has a low build height and larger inner diameter while offering the same or higher torque specifications compared to other torque motors. The low motor mass provides the opportunity to improve entire stage designs. Offering great opportunities to lower total cost of ownership in an application.

Tecnotion's extensive experience in coil design also reflects in the QTR thermal resistance characteristics. The QTR series offers enhanced thermal management compared to competitors. This can contribute, for instance, to motor reliability.

Finally, the QTR series also has a low cogging value like Tecnotion's iron core motor series, offering a smooth running characteristic and excellent position accuracy.

#### The range

The initial torque range consists of a series of three different outer diameters of 105, 133 and 160 mm for the largest motor. Each series has four build heights ranging from 17 mm up to 60 mm.



**QTR-A 105 Series**

*Tp 1.9..18Nm Tc 1.4..12Nm*

The QTR-A 105 is the smallest torque motor with a 105mm outer and 56mm inner diameter. This series offers a continuous torque range from 1.7 up to 12Nm spread over its 4 types. The largest motor in the series can attain a peak torque of 18Nm with a total motor mass of under 2000 gram.



**QTR-A 133 Series**

*Tp 3.7..35.3Nm Tc 2.6..21.9Nm*

The QTR-A 133 is the medium range of the QTR motors. It covers the torque range from 2.6 to 21.9Nm. The largest 60 mm high QTR-A-133-60 motor offers a peak torque of over 35.3Nm.



**QTR-A 160 series**

*Tp 6.2..58.3Nm Tc 4.1..36.3Nm*

The 160 series is the largest in diameter of the torque range. The smallest of the series, QTR-A-160-17 starts with a continuous torque of 4.4Nm. The range ends with the large QTR-A-160-60 with a continuous torque of 36.3Nm and a peak of 58.3Nm.

# Features

## Tecnotion's QTR torque motor performance advantages

The direct drive technology of brushless torque motors is a perfect way to enhance productivity, accuracy, and dynamic performance of applications. The technology lowers costs, makes designs slimmer, and reduce wear and tear. Torque motors eliminate the need for mechanical transmissions like gearboxes, belts and speed reducers. Between rotor and stator there is no contact, this means no mechanical wear.

**Direct drive**  
 Higher stiffness no backlash.

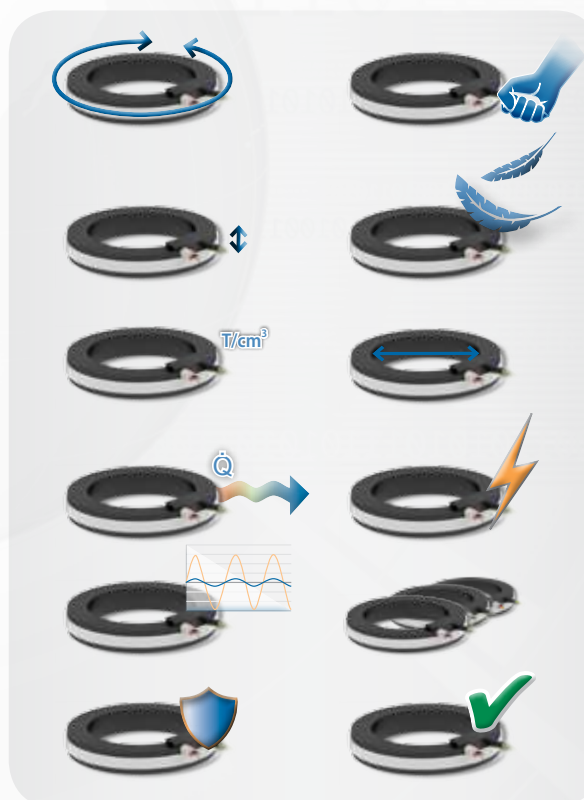
**Ultra thin design**  
 The lower build height allows to build flatter axis, resulting in less tipping and settling time. Extraordinary flexibility in designing the motor in to small spaces.

**Tecnotion QTR has the highest torque density in the market**  
 More torque in a smaller packing means lowering footprint.

**Low thermal resistance**  
 Allowing good heat transfer, achieving an extremely high continuous torque when using a descent size heatsink or active cooling.

**Low cogging value , low total harmonic distortion THD**  
 For smooth motion and position accuracy in your application.

**Encapsulated design**  
 No open coil wires which can be damaged or that need to be covered up for safety reasons.



**Shielded cable with strain relief**

No shielding EMC issues with loose wires. No risk to damage the motor by accidentally pulling the cable.

**Low stator and rotor mass**

Lower masses increase the dynamics and response of the system by lowering the inertia. It hands the opportunity to improve entire stage designs! And as a result, lowering an applications cost of ownership.

**Large inner diameter**

Allows easy integration of a large number of cables and hoses or allows large shaft fittings.

**High voltage insulated, up to 300VDC/600VDC busvoltage**

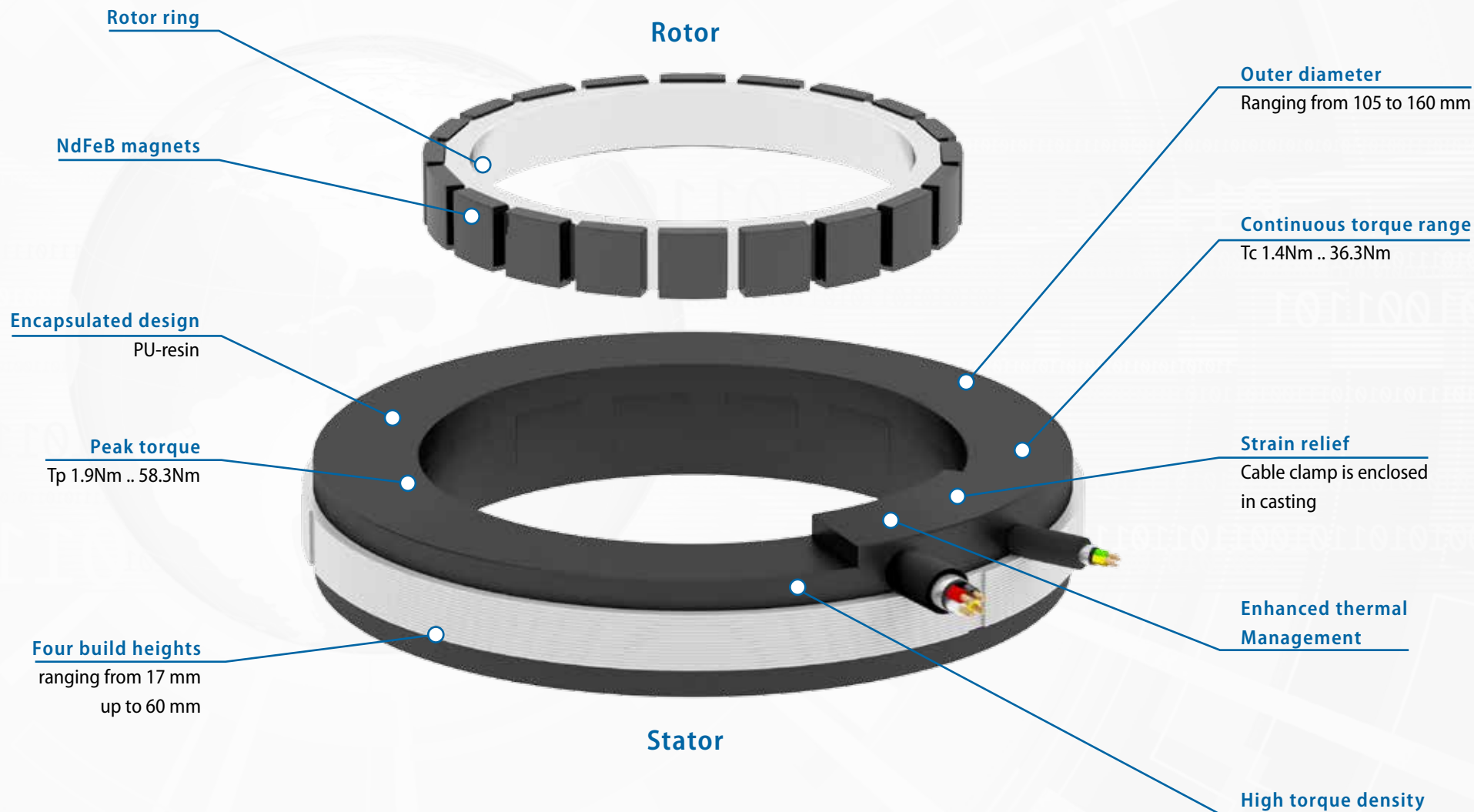
Enabling the use of a wide range of servo drives, and power supplies.

**Good product repeatability**

All motors have specifications with extremely little variation between them.

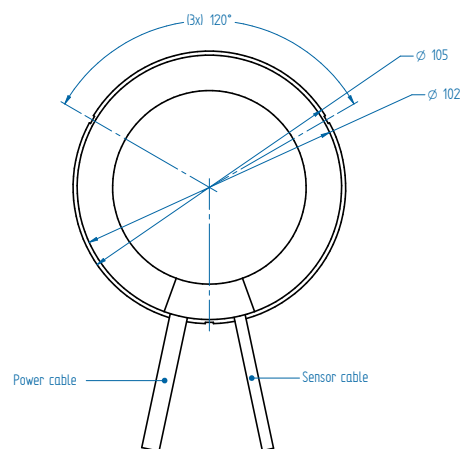
**100% QC**

All products are 100% mechanically and electrically tested.

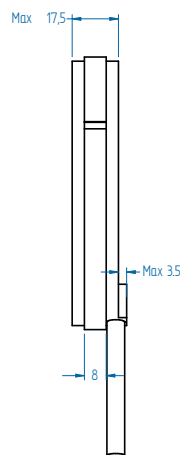


Mounting instructions and tolerances can be found in the Torque installation manual. Manuals and 3D CAD files can be downloaded from our website.

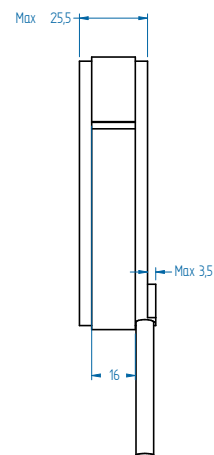
## STATOR



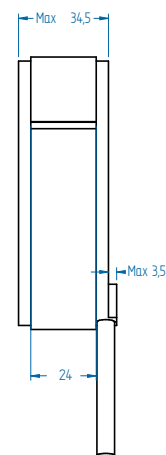
QTR-A-105-17



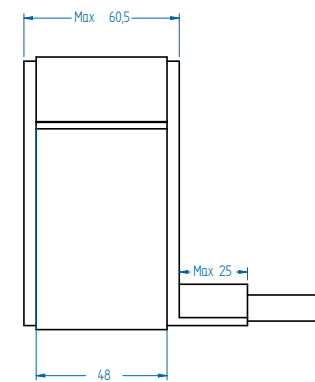
QTR-A-105-25



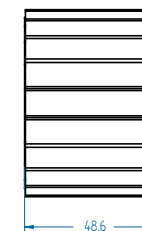
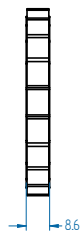
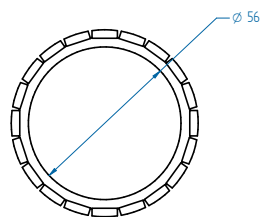
QTR-A-105-34



QTR-A-105-60



## ROTOR





	Parameter	Remarks	Symbol	Unit	QTR-A-105-17	QTR-A-105-25	QTR-A-105-34	QTR-A-105-60
Performance	Winding type				N	N	N	N
	Motortype. max voltage ph-ph				3-phase synchronous frameless Torque. 230V <sub>acrms</sub> (300V <sub>dc</sub> )			420V <sub>acrms</sub> (600V <sub>dc</sub> )
	Ultimate Torque @ 20°C/s increase	magnet @ 25°C	T <sub>u</sub>	Nm	2.9	6.1	10.6	28.4
	Peak Torque @ 6°C/s increase	magnet @ 25°C	T <sub>p</sub>	Nm	1.9	3.9	6.7	18.1
	Continuous Torque	coil@100°C	T <sub>c</sub>	Nm	1.4	3.2	5.4	12
	Maximum speed*	@Tc	n <sub>max</sub>	rpm	6918	3579	1866	1386
	Motor Torque constant	up to I <sub>c</sub>	K <sub>t</sub>	Nm/A <sub>rms</sub>	0.297	0.595	1.07	2.86
	Motor constant	coils @ 25°C	K <sub>m</sub>	(Nm) <sup>2</sup> /W	0.021	0.061	0.127	0.40
Electrical	Ultimate Current	magnet @ 70°C	I <sub>u</sub>	A <sub>rms</sub>	13.8	13.8	13.3	13.5
	Peak Current	magnet @ 25°C	I <sub>p</sub>	A <sub>rms</sub>	7.56	7.56	7.31	7.37
	Maximum Continuous Current**	coils @ 100°C	I <sub>c</sub>	A <sub>rms</sub>	4.64	5.34	5.05	4.19
	Back EMF Phase-Phase <sub>peak</sub>		K <sub>e</sub>	V/krpm	25	51	92	244
	Back EMF Phase-Phase <sub>RMS</sub>		K <sub>e</sub>	V/krpm	18	36	65	173
	Coil Resistance per Phase	coils @ 25°C ex. cable	R	Ω	1.38	1.93	3.02	6.84
	Coil induction per Phase	l < 0.6 lp	L	mH	2.58	4.05	7.93	25.3
	Electrical Time Constant	coils @ 25°C	τ <sub>e</sub>	ms	1.9	2.1	2.6	3.7
Thermal	Poles		N <sub>mgn</sub>	nr	20	20	20	20
	Continuous Power Loss	coils @ 100°C	P <sub>c</sub>	W	115	214	300	469
	Thermal Resistance***	coils to mount. sfc.	R <sub>th</sub>	°C/W	0.65	0.35	0.25	0.16
	Thermal Time Constant	Up to 63% max. coiltemp	τ <sub>th</sub>	s	21	16	17	25
Mechanical	Temperature Cut-off / Sensor				PTC 1kΩ / KTY83-122			
	Stator OD		OD <sub>S</sub>	mm	105	105	105	105
	Rotor ID		ID <sub>R</sub>	mm	56	56	56	56
	Motor Height		H <sub>motor</sub>	mm	17	25	34	60
	Lamination Stack Height		H <sub>arm</sub>	mm	8	16	24	48
	Rotor Inertia		J <sub>R</sub>	kg*m <sup>2</sup>	7.7E-05	1.5E-04	2.2E-04	4.3E-04
	Stator Mass	ex. cables	M <sub>S</sub>	g	299	472	746	1476
	Rotor Mass		M <sub>R</sub>	g	79	146	218	433
	Total Mass	ex. cables	M <sub>T</sub>	g	378	618	964	1909
	Cable Mass	all cables	m	g	63	63	63	95
Cable Type (Power)	length 0.5 m	d	mm (AWG)	6.5 (20)			9.6 (18)	
Cable Type (Sensor)	length 0.5 m	d	mm (AWG)	4.3 (26)				



QTR-A-105 Stator and rotor shown with a height of 17 mm

All specifications ±10%

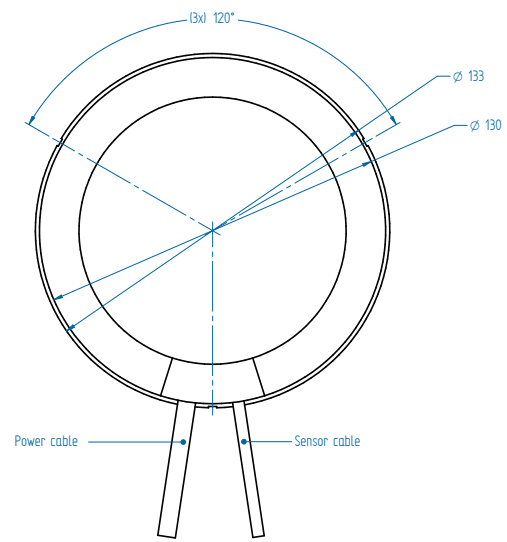
\* Actual values depend on bus voltage. Please check the T/n diagram in our simulation tool.

\*\* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.

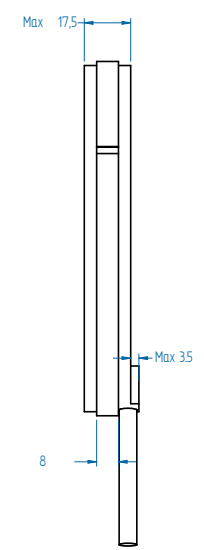
\*\*\* R<sub>th</sub> based on radial mounting of rotor lamination stack.

Mounting instructions and tolerances can be found in the Torque installation manual. Manuals and 3D CAD files can be downloaded from our website.

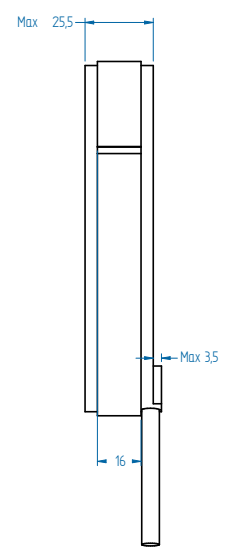
**STATOR**



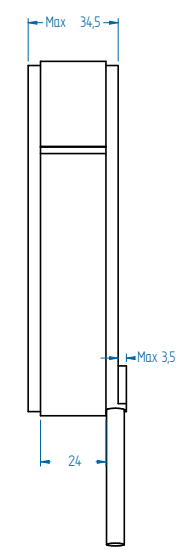
QTR-A-133-17



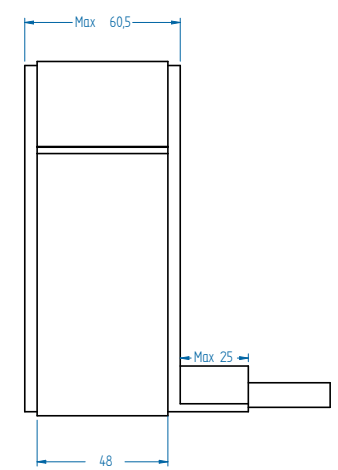
QTR-A-133-25



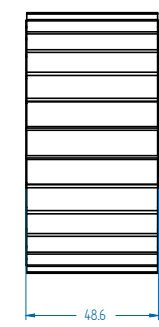
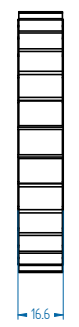
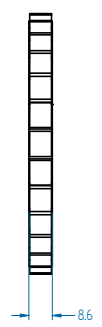
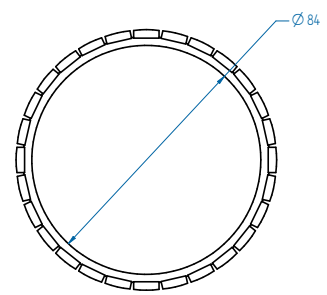
QTR-A-133-34



QTR-A-133-60



**ROTOR**



Parameter		Remarks	Symbol	Unit	QTR-A-133-17	QTR-A-133-25	QTR-A-133-34	QTR-A-133-60
Performance	Winding type				N	N	N	N
	Motor type, max voltage ph-ph				3-phase synchronous frameless Torque, 230V <sub>acrms</sub> (300V <sub>dc</sub> )			420V <sub>acrms</sub> (600V <sub>dc</sub> )
	Ultimate Torque @ 20°C/s increase	magnet @ 25°C	T <sub>u</sub>	Nm	5.60	11.9	20.6	55.5
	Peak Torque @ 6°C/s increase	magnet @ 25°C	T <sub>p</sub>	Nm	3.77	7.5	13.1	35.3
	Continuous Torque	coil@100°C	T <sub>c</sub>	Nm	2.57	5.86	10	21.9
	Maximum speed*	@T <sub>c</sub>	n <sub>max</sub>	rpm	3477	1779	910	684
	Motor Torque constant	Up to I <sub>c</sub>	K <sub>t</sub>	Nm/A <sub>rms</sub>	0.58	1.16	2.09	5.57
	Motor constant	coils @ 25°C	K <sub>m</sub>	(Nm) <sup>2</sup> /W	0.058	0.167	0.344	1.08
Electrical	Ultimate Current	magnet @ 70°C	I <sub>u</sub>	A <sub>rms</sub>	13.8	13.8	13.3	13.5
	Peak Current	magnet @ 25°C	I <sub>p</sub>	A <sub>rms</sub>	7.56	7.56	7.31	7.37
	Maximum Continuous Current**	coils @ 100°C	I <sub>c</sub>	A <sub>rms</sub>	4.43	5.05	4.77	3.93
	Back EMF Phase-Phase <sub>peak</sub>		K <sub>e</sub>	V/krpm	50	99	179	476
	Back EMF Phase-Phase <sub>RMS</sub>		K <sub>e</sub>	V/krpm	35	70	126	337
	Coil Resistance per Phase	coils @ 25°C ex. cable	R	Ω	1.93	2.70	4.23	9.58
	Coil induction per Phase	I < 0.6 I <sub>p</sub>	L	mH	3.74	5.87	11.5	36.6
	Electrical Time Constant	coils @ 25°C	τ <sub>e</sub>	ms	1.94	2.18	2.72	3.83
Thermal	Poles		N <sub>mgn</sub>	nr	28	28	28	28
	Continuous Power Loss	coils @ 100°C	P <sub>c</sub>	W	147	268	375	577
	Thermal Resistance***	coils to mount. sfc.	R <sub>th</sub>	°C/W	0.51	0.28	0.20	0.13
	Thermal Time Constant	Up to 63% max. coiltemp	τ <sub>th</sub>	s	23	18	19	29
Mechanical	Temperature Cut-off / Sensor				PTC 1kΩ / KTY83-122			
	Stator OD		OD <sub>s</sub>	mm	133	133	133	133
	Rotor ID		ID <sub>r</sub>	mm	84	84	84	84
	Motor Height		H <sub>motor</sub>	mm	17	25	34	60
	Lamination Stack Height		H <sub>arm</sub>	mm	8	16	24	48
	Rotor Inertia		J <sub>R</sub>	kg*m <sup>2</sup>	2.1E-04	4.2E-04	6.2E-04	1.2E-03
	Stator Mass	ex. cables	M <sub>s</sub>	g	414	717	1037	2090
	Rotor Mass		M <sub>R</sub>	g	106	208	309	613
	Total Mass	ex. cables	M <sub>T</sub>	g	520	925	1346	2703
	Cable Mass	all cables	m	g	63	63	63	95
Cable Type (Power)	length 0.5 m	d	mm (AWG)	6.5 (20)			9.6 (18)	
Cable Type (Sensor)	length 0.5 m	d	mm (AWG)	4.3 (26)				



QTR-A-133 Stator and rotor shown with a height of 17 mm

All specifications ±10%

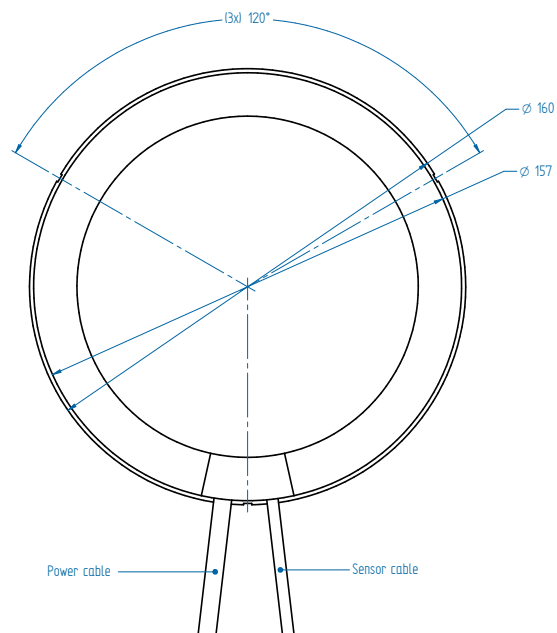
\* Actual values depend on bus voltage. Please check the T/n diagram in our simulation tool.

\*\* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.

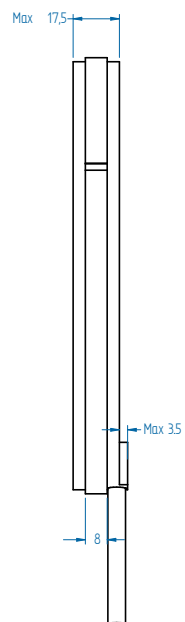
\*\*\* R<sub>th</sub> based on radial mounting of rotor lamination stack.

Mounting instructions and tolerances can be found in the Torque installation manual. Manuals and 3D CAD files can be downloaded from our website.

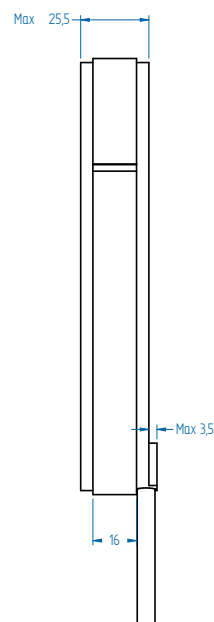
## STATOR



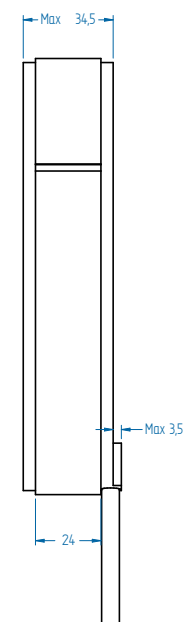
QTR-A-160-17



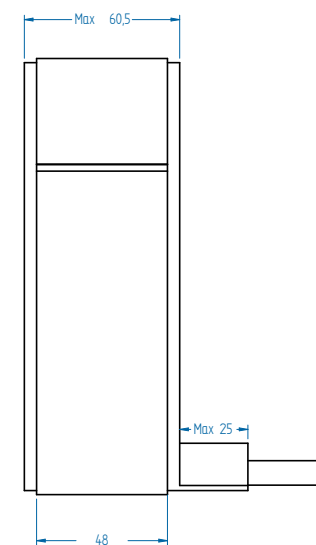
QTR-A-160-25



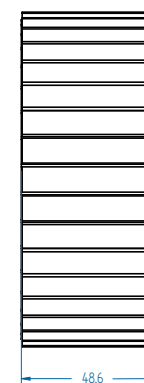
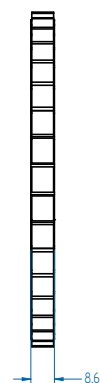
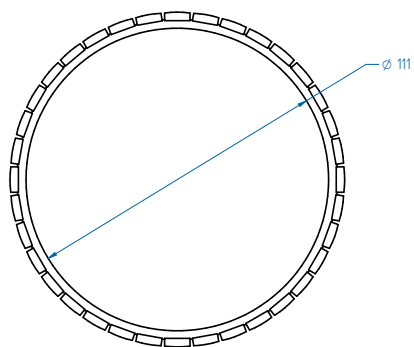
QTR-A-160-34



QTR-A-160-60



## ROTOR





	Parameter	Remarks	Symbol	Unit	QTR-A-160-17	QTR-A-160-25	QTR-A-160-34	QTR-A-160-60
Performance	Winding type				N	N	N	N
	Motor type, max voltage ph-ph				3-phase synchronous frameless Torque, 230V <sub>ac rms</sub> (300V)			420V <sub>ac rms</sub> (600V <sub>dc</sub> )
	Ultimate Torque @ 20°C/s increase	magnet @ 25°C	T <sub>u</sub>	Nm	9.26	19.6	34.1	91.6
	Peak Torque @ 6°C/s increase	magnet @ 25°C	T <sub>p</sub>	Nm	6.23	12.5	21.7	58.3
	Continuous Torque	coil@100°C	T <sub>c</sub>	Nm	4.08	9.42	15.7	36.3
	Maximum speed*	@T <sub>c</sub>	n <sub>max</sub>	rpm	2095	1042	526	385
	Motor Torque constant	Up to I <sub>c</sub>	K <sub>t</sub>	Nm/A <sub>rms</sub>	0.96	1.92	3.45	9.20
	Motor constant	coils @ 25°C	K <sub>m</sub>	(Nm) <sup>2</sup> /W	0.124	0.353	0.728	2.29
Electrical	Ultimate Current	magnet @ 70°C	I <sub>u</sub>	A <sub>rms</sub>	13.8	13.8	13.3	13.5
	Peak Current	magnet @ 25°C	I <sub>p</sub>	A <sub>rms</sub>	7.6	7.6	7.3	7.4
	Maximum Continuous Current**	coils @ 100°C	I <sub>c</sub>	A <sub>rms</sub>	4.26	4.91	4.56	3.95
	Back EMF Phase-Phase <sub>peak</sub>		K <sub>e</sub>	V/krpm	82	164	295	787
	Back EMF Phase-Phase <sub>RMS</sub>		K <sub>e</sub>	V/krpm	58	116	209	556
	Coil Resistance per Phase	coils @ 25°C ex. cable	R	Ω	2.47	3.47	5.45	12.3
	Coil induction per Phase	l < 0.6 lp	L	mH	4.89	7.68	15.0	47.9
	Electrical Time Constant	coils @ 25°C	τ <sub>e</sub>	ms	1.98	2.21	2.75	3.88
Thermal	Poles		N <sub>mgn</sub>	nr	36	36	36	36
	Continuous Power Loss	coils @ 100°C	P <sub>c</sub>	W	174	326	441	750
	Thermal Resistance***	coils to mount. sfc.	R <sub>th</sub>	°C/W	0.43	0.23	0.17	0.1
	Thermal Time Constant	Up to 63% max. coiltemp	τ <sub>th</sub>	s	25	19	21	29
Mechanical	Temperature Cut-off / Sensor				PTC 1kΩ / KTY83-122			
	Stator OD		OD <sub>s</sub>	mm	160	160	160	160
	Rotor ID		ID <sub>R</sub>	mm	111	111	111	111
	Motor Height		H <sub>motor</sub>	mm	17	25	34	60
	Lamination Stack height		H <sub>arm</sub>	mm	8	16	24	48
	Rotor Inertia		J <sub>R</sub>	kg*m <sup>2</sup>	4.7E-04	9.2E-04	1.4E-03	2.6E-03
	Stator Mass	ex. cables	M <sub>s</sub>	g	527	875	1212	2555
	Rotor Mass		M <sub>R</sub>	g	138	269	401	754
	Total Mass	ex. cables	M <sub>T</sub>	g	665	1144	1613	3309
	Cable Mass	all cables	m	g	63	63	63	95
	Cable Type (Power)	length 0.5 m	d	mm (AWG)	6.5 (20)			9.6 (18)
Cable Type (Sensor)	length 0.5 m	d	mm (AWG)	4.3 (26)				



QTR-A-160 Stator and rotor shown with a height of 17 mm

All specifications ±10%

\* Actual values depend on bus voltage. Please check the T/n diagram in our simulation tool.

\*\* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.

\*\*\* R<sub>th</sub> based on radial mounting of rotor lamination stack.

# Additional products

To download our Torque motor simulation tool, 3D CAD files, installation manuals, product specifications

and more, visit our website at:

[www.tecnotion.com](http://www.tecnotion.com)



## Product Series

*Iron Core & Ironless Motor Series*

Tecnotions linear motor series rely on 25 years of linear motor development experience. All motors excel in their force density ratings. They offer continuous force in a range of 10 Newton to 3000 Newton in a surprisingly small package.

Tecnotion can provide linear solutions for most applications which require a strong iron core linear motor or a highly dynamic ironless type linear motor.

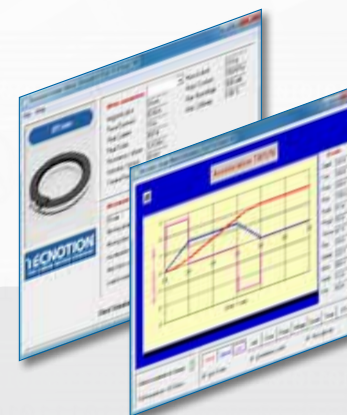


## Vacuum Series

*Outgassing down to 10<sup>-8</sup> mbar*

Many years of experience is used in designing and building vacuum coils and magnets. Tecnotion can supply any vacuum linear motor that can match even the strictest vacuum requirements, for instance in the semiconductor industry.

Our vacuum rated ironless linear motors are a specifically designed coil units and magnet yokes for use in high- vacuum, down to 10<sup>-8</sup> mBar.



## Simulation Tool

*Analyze your application*

Save precious time by using our FREE Torque motor simulation tool. Our specialized software helps you find the best motor for the application and generate reports within seconds, without having to make time consuming calculations by hand.

The tool will provide you with diagrams for position, velocity, acceleration, jerk, torque, power, voltage, current, temperature, torque vs. velocity and more.



## Custom Linear Motors

*Motor solutions*

Besides the standard catalogue items we offer custom linear motor solutions. Some examples: custom windings, cable confection and vacuum motors for transport and positioning in vacuum.

Besides this Tecnotion offers moving magnet motors and linear actuators, completely designed toward needs. For more information please contact Tecnotion.



## Article list

Series	Article	Art. Code
QTR	Torque Kit QTR-A-105-17-N	4022 368 6120
QTR	Torque Kit QTR-A-105-25-N	4022 368 6121
QTR	Torque Kit QTR-A-105-34-N	4022 368 6122
QTR	Torque Kit QTR-A-105-60-N	4022 368 6123
QTR	Torque Kit QTR-A-133-17-N	4022 368 6140
QTR	Torque Kit QTR-A-133-25-N	4022 368 6141
QTR	Torque Kit QTR-A-133-34-N	4022 368 6142
QTR	Torque Kit QTR-A-133-60-N	4022 368 6143
QTR	Torque Kit QTR-A-160-17-N	4022 368 6160
QTR	Torque Kit QTR-A-160-25-N	4022 368 6161
QTR	Torque Kit QTR-A-160-34-N	4022 368 6162
QTR	Torque Kit QTR-A-160-60-N	4022 368 6163