Fan blown high performance AC brushless servo motor

095 to 190 Frames
2.8 Nm to 104.5 Nm
(231.0 Nm Peak)

CONTROL TECHNIQUES™

Nidec
All for dreams

Unimotor fm

Unimotor fm is a high performance brushless AC servo motor range for use in demanding continuous duty applications. It's designed to be flexible to your requirements, available in six frame sizes with various mounting arrangements and motor lengths.

Reliability and innovation

Since we started, innovation and reliability has been at the heart of what we do. Unimotor fm is no exception. We prioritize motor efficiency and well thought out design that won't let you down. Rigorous testing ensures this, that's why we've a market leading reputation for both performance and quality.

Matched motor and drive combinations

We design our drives and motors to function as an optimized system. Unimotor fm is the perfect partner for Unidrive M and Digitax ST.

Faster set-up, optimized performance

You can quickly transfer motor data to the drive using a Unimotor fm fitted with a SinCos or Absolute encoder. This pulls in information from an "electronic nameplate", making it quick and easy to optimize system setup, simplifying commissioning and maintenance. That's why Unimotor fm is the perfect partner for Unidrive M.

Features

Unimotor fm is suitable for many industrial applications, the extensive range of features include:

- Torque range from 1.4 Nm to 136 Nm
- High energy parking brakes
- Numerous connector variants, including: vertical, 90° low profile, 90° rotatable and hybrid box on frame size 250
- Variety of flange possibilities (IEC/NEMA)
- Various shaft diameters; keyed or plain
- IP65 conformance, sealing against water spray and dust when setup
- Winding voltages for inverter supply of 400 V and 220 V
- Rated speeds from 1,000 to 6,000 rpm and others available
- Thermal protection by PTC thermistor/optional KTY84.130 sensor
- 48 Vdc voltage and lower speeds on request

Accuracy and resolution to suit your application requirements

For performance, the right feedback device is critical. We offer a range of options with different levels of accuracy and resolution:

- Resolver: robust for extreme applications and conditions – low accuracy, medium resolution
- Incremental encoder: high accuracy, medium resolution
- Inductive/capacitive SinCos/Absolute: medium accuracy, high resolution
- Optical/SinCos/Absolute: high accuracy, high resolution
- Single turn and multi-turn: Hiperface and EnDat protocols supported

Ideal for retrofit

We've kept the same connector interface types and mounting dimensions. That means existing customers can upgrade with minimal effort.

Custom built motors

We understand that each project is individual. For this reason we can develop application specific motors, removing constraints from your design process.

Our custom built motors can be identified by the prefix 'S' at the end of a part number. Additional letters following the 'S' identify custom shafts, connections or coatings.

e.g. SPZ - Motor is left unpainted
SON - Motor is fully painted

Wide range of accessories

In addition we offer a range of accessories to cover your system requirements:

- Feedback and power cables for static and dynamic applications
- Gearboxes
- Cable connectors

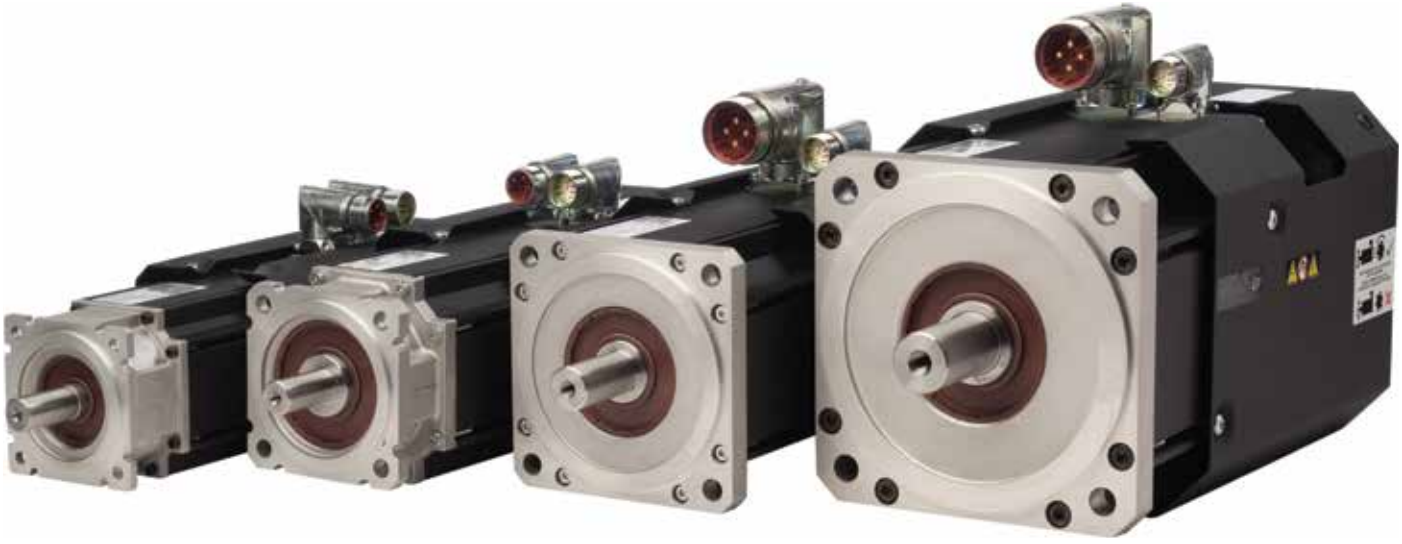
095 - 190 Unimotor fm fan blown motors

In many instances you may need more performance across the torque range. We've modified the electromagnetic construction our Unidrive fm motors to do just that. Our fan blown range increases performance with higher rms values. For example, when compared to the Unimotor fm, the 190 fan blown variant increases stall torque from 77Nm to 104.5Nm.

We've selected the motors which give the best torque increases across the available frame sizes.

To allow for higher currents, the 142 fan blown range is only available with the size 1.5 (53A rated) power connector.

For more information on brake torque, switching frequency derating, feedback selection and cables, please refer to the Unimotor fm Product Data.



Quick reference table

Frame size	PCD (mm)	Unimotor U5					Page No.
095	100	2.8 – 11.9					9
115	115	4.6 – 22.1					10
142	165	7.1 – 34.9					11
190	215			23.7 – 104.5			12
Stall	**0**	**10**	**20**	**35**	**50**	**105**	**Nm**

Ordering Information

The information below provides the various options to create an order code for a Unimotor fm.

The details in the top row of the table (095U5B400BACAA100190) are an example of an order reference (Std = Standard selection, Opt = Optional selection).

095	U	5	B	40	0	B
Frame size	Motor voltage	Peak torque selection	Stator length	Rated speed	Brake	Connection type[1]
	095-190 frame	095-190 frame	095 frame	095 frame	095 - 190 frame	Size 1
095	**U** = 400V	**5** = Peak torque	D	**30** = 3000 rpm	**0** = Not fitted (Std)	**B** = Power and signal 90° rotatable
115			E	**40** = 4000 rpm	**5** = High energy dissipation parking brake	**C** = Power 90° rotatable and signal vertical
142			115 frame	**60** = 6000 rpm		
190			D	115 frame		
			E	**30** = 3000 rpm	**X** = Special	**V** = Power and signal vertical
			142 frame	**40** = 4000 rpm		
			D	**60** = 6000 rpm		Size 1.5
			E	142 frame		**J** = Power and signal 90° rotatable
			190 frame	**30** = 3000 rpm		
			G	**40** = 4000 rpm		**N** = Power 90° rotatable and signal vertical
			H	**60** = 6000 rpm		
				190 frame		**M** = Power and signal vertical
				20 = 2000 rpm		
				30 = 3000 rpm		Hybrid box
				40 = 4000 rpm		**H** = Power hybrid box

[1] 142 and 190 frame motors the Power plug will be size 1.5

A	CA		A	100		190		
Output shaft	Feedback device		Inertia	PCD		Shaft diameter		
095 - 190 frame	095 - 190 frame		095 - 190 frame	095 frame only				
A = Key	**AE** = Resolver		**A** = Standard + PTC[2]	100	Std	19.0	D-E	Opt
B = Plain shaft	**CA** = Incremental Encoder	CFS50	**B** = High + PTC			22.0	D-E	Std
	EC = Inductive EnDat SinCos Multi-turn	EQI 1331	**C** = Standard + KTY[3]	115 frame only				
	FC = Inductive EnDat SinCos Single-turn	ECI 1319		115	Std	24.0	D	Std
	RA = Optical Hiperface SinCos Multi-turn	SRM 50				28.0	E	Std
	SA = Optical Hiperface SinCos Single-turn	SRS 50		142 frame only				
	EB = Optical EnDat SinCos Multi-turn	EQN 1325		165	Std	24.0	D-E	Opt
	FB = Optical EnDat SinCos Single-turn	ECN1313				28.0	D	Std
						32.0	E	Std
				190 frame only				
				215	Std	32.0	G-H	Opt
						38.0	G	Std
						42.0	H	Std

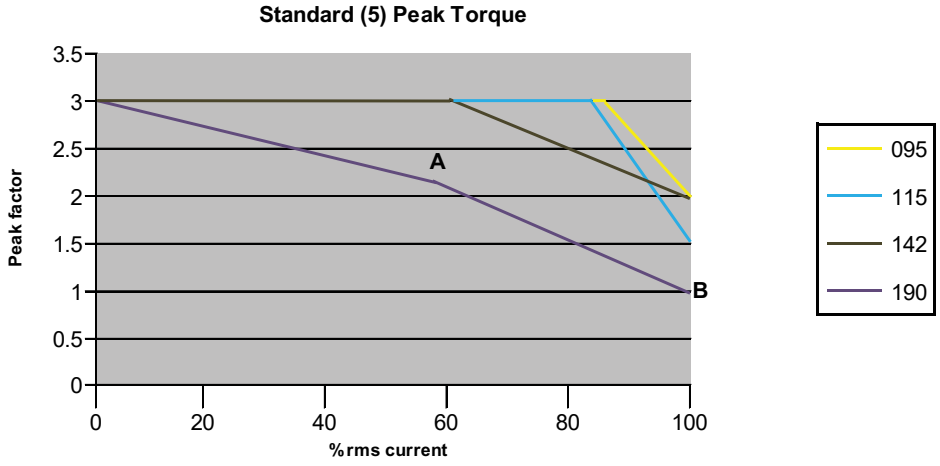
[2] PTC thermistor = DIN44082
[3] KTY thermistor = KTY84

095 - 190 Unimotor fm fan blown motors

Even though the stall and rated torque are increased in the Unimotor fm fan blown range, there is no increase in the peak value. This means that the peak factors for fan blown motors are different to standard self-cooled motors. The new values are shown in the table.

U5 Frame	Peak factor @ 0 - 100% rms	
095	Peak Factor 0% - 88% rms	Peak Factor @100% rms
	3	2
115	Peak Factor 0% - 86% rms	Peak Factor @100% rms
	3	1.5
142	Peak Factor 0% - 57% rms	Peak Factor @100% rms
	2.15	1
190	Peak Factor 0% - 60% rms	Peak Factor @100% rms
	3	2

Figure 1 Unimotor fm fan blown motor peak torque graph



Peak torque is defined for a maximum period of 250ms, rms % rms = % rms duty cycle Current for motor in application

To use the graph correctly, you will need to calculate the rms current and rms speed of the application. The rms current value must be converted into a percentage of the full motor current. For example, if the full current available is 10A and the rms current is 7.5A, then the percentage rms current value is 75%. Plot this value onto the graph to obtain the peak factor. The peak factor is then used to calculate the peak torque value using the table to the right.

Peak factor	x	Stall current	x	kt	=	Peak torque
An example would be with a 142U5E300 motor, where the % rms current value is calculated to 50%, the peak factor would be 2.15. (Point A)						
Peak factor	**x**	**Stall current**	**x**	**kt**	**=**	**Peak torque**
2.15	x	21.8	x	1.6	=	75.0Nm
But if the % rms current were to be calculated at a level of 100%, the peak factor would equal 1.00. (Point B)						
Peak factor	**x**	**Stall current**	**x**	**kt**	**=**	**Peak torque**
1.00	x	21.8	x	1.6	=	34.9Nm

IP Ratings

Motor

IP65S - No ingress of dust; no contact with or approach to live or moving parts inside the enclosure. Water projected by a nozzle against enclosure from any direction shall have no harmful effects. (Excluding the front shaft seal.)

(S = device standing still during water test)

Fan motor and circuit board

IP54 - The fan motor and circuit board are coated to protect them against splash water and humidity.

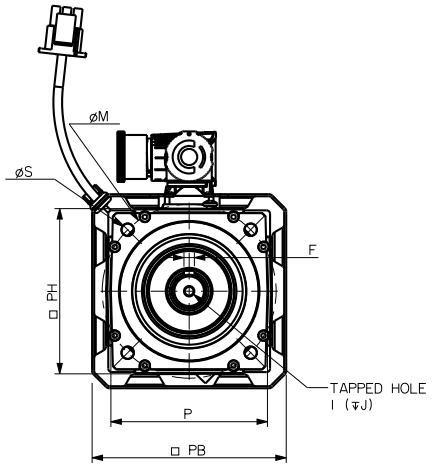
Complete Unimotor fm fan blown motor assembly

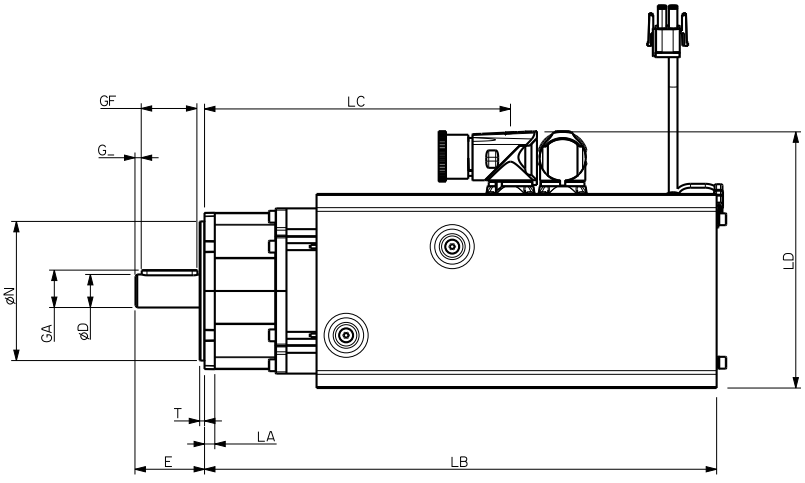
IP20 - Protected against solid objects >12mm. E.g. fingers.

Frame Size 095

Motor frame size (mm)		095U5	
Voltage (Vrms)		380-480	
Frame length		D	E
Continuous stall torque (Nm)		10.3	11.9
Peak torque (Nm)		23.7	27.8
Standard inertia (kgcm2)		4.83	5.98
High Inertia (kgcm²)		6.69	7.80
Winding thermal time constant (sec)		108.3	111.7
Motor weight unbraked (kg)		8.2	9.4
Motor weight braked (kg)		8.8	10.0
Number of poles		6	6
Speed 3,000 (rpm)	Kt (Nm/A) =	1.60	
	Ke (V/krpm) =	98	
Rated torque (Nm)		9.5	10.8
Stall current (A)		6.5	7.4
Rated power(kW)		2.97	3.38
R (ph-ph) (Ohms)		3.2	2.27
L (ph-ph) (mH)		15.95	12.06
Recommended power conn' size		1	1
Speed 4,000 (rpm)	Kt (Nm/A) =	1.20	
	Ke (V/krpm) =	73.5	
Rated torque (Nm)		9.0	10.1
Stall current (A)		8.6	9.9
Rated power(kW)		3.75	4.22
R (ph-ph) (Ohms)		1.81	1.40
L (ph-ph) (mH)		8.86	7.25
Recommended power conn' size		1	1
Speed 6,000 (rpm)	Kt (Nm/A) =	0.80	
	Ke (V/krpm) =	49	
Rated torque (Nm)		6.9	7.1
Stall current (A)		12.9	14.9
Rated power(kW)		4.33	4.45
R (ph-ph) (Ohms)		0.77	0.58
L (ph-ph) (mH)		3.83	3.02
Recommended power conn' size		1	1

C6E001 Iss 25





Drawing number: IM/0744/GA Iss 2

Δt= 100 °C winding 40 °C maximum ambient

All data subject to ± 10 % tolerance

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20 °C ambient at 12 kHz drive switching frequency

All other figures relate to a 20 °C motor temperature

Maximum intermittent winding temperature is 140 °C

Motor dimensions (mm)

Note all dimensions shown are at nominal

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height (B)	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Fan housing	Mounting bolts
	LB (± 1)	LC (± 1)	LB (± 1)	LC (± 1)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 1)	P (± 0.4)	S (H14)	M	PH (± 0.6)	PB	
095D	384.4	265.9	414.4	295.9	5.9	2.8	80.0	147.3	90.0	7.0	100.0	95.0	111.6	M6
095E	414.4	295.9	444.4	325.9										

Output shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	D	E (± 0.45)	GA	GF (± 0.25)	G_ (± 1.1)	F	I	J (± 1)
D-E (Opt)	19.0	40.0	21.5	32.0	3.6	6.0	M6x1.0	17.0
D-E (Std)	22.0	50.0	24.5	40.0	4.6	6.0	M8x1.25	20.0

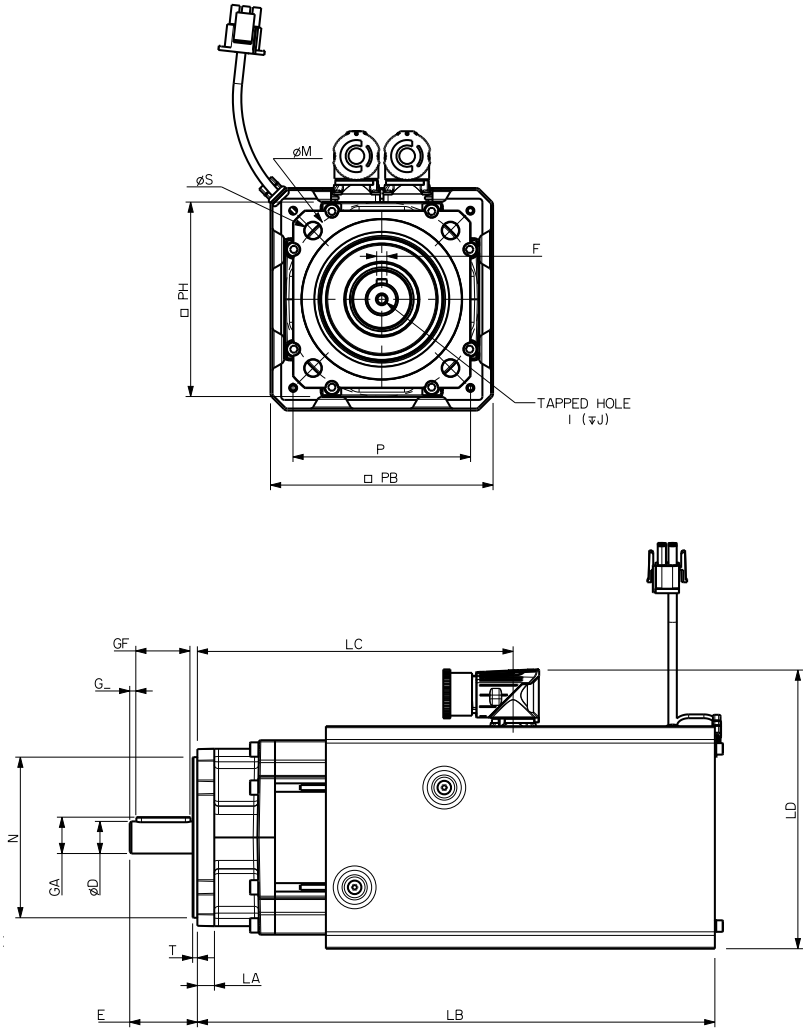
Optional connector height (mm)

Connector type	Overall height
	LD (± 1)
A	139.8
C	147.3
V	139.8

Frame Size 115

Motor frame size (mm)		115U5	
Voltage (Vrms)		380-480	
Frame length		D	E
Continuous stall torque (Nm)		17.0	22.1
Peak torque (Nm)		41.0	48.0
Standard inertia (kgcm2)		12.50	14.80
High Inertia (kgcm²)		17.10	19.40
Winding thermal time constant (sec)		127.4	141.5
Motor weight unbraked (kg)		12.6	14.5
Motor weight braked (kg)		13.8	15.7
Number of poles		6	6
Speed 3,000 (rpm)	Kt (Nm/A) =	1.60	
	Ke (V/krpm) =	98	
Rated torque (Nm)		14.0	17.1
Stall current (A)		10.6	13.8
Rated power(kW)		4.40	5.39
R (ph-ph) (Ohms)		1.5	1.23
L (ph-ph) (mH)		11.60	9.89
Recommended power conn' size		1	1
Speed 4,000 (rpm)	Kt (Nm/A) =	1.20	
	Ke (V/krpm) =	73.5	
Rated torque (Nm)		13.2	16.1
Stall current (A)		14.2	18.4
Rated power(kW)		5.53	6.72
R (ph-ph) (Ohms)		0.84	0.66
L (ph-ph) (mH)		6.27	5.35
Recommended power conn' size		1	HYBRID
Speed 6,000 (rpm)	Kt (Nm/A) =	0.80	
	Ke (V/krpm) =	49	
Rated torque (Nm)		10.4	12.6
Stall current (A)		21.3	27.7
Rated power(kW)		6.51	7.91
R (ph-ph) (Ohms)		0.40	0.31
L (ph-ph) (mH)		3.07	2.46
Recommended power conn' size		HYBRID ONLY	

C6E001 Iss 25



Drawing number: IM/0743/GA Iss 2

Δt= 100 °C winding 40 °C maximum ambient

All data subject to ± 10 % tolerance

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20 °C ambient at 12 kHz drive switching frequency

All other figures relate to a 20 °C motor temperature

Maximum intermittent winding temperature is 140 °C

Motor dimensions (mm)

Note all dimensions shown are at nominal

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height (B)	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Fan housing	Mounting bolts
	LB (± 1)	LC (± 1)	LB (± 1)	LC (± 1)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 1)	P (± 0.2)	S (H14)	M	PH (± 0.6)	PB	
115D	396.0	283.8	426.0	313.8	10.1	2.8	95.0	164.8	105.0	10.0	115.0	115.0	131.6	M9
115E	426.0	313.8	456.0	343.8										

Output shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	D	E (± 0.45)	GA	GF (± 0.25)	G_ (± 1.1)	F	I	J (± 1)
D (Std)	24.0	50.0	27.0	40.0	4.6	8.0	M8x1.25	20.0
E (Std)	28.0	60.0	31.0	50.0	4.6	8.0	M10x1.5	23.0

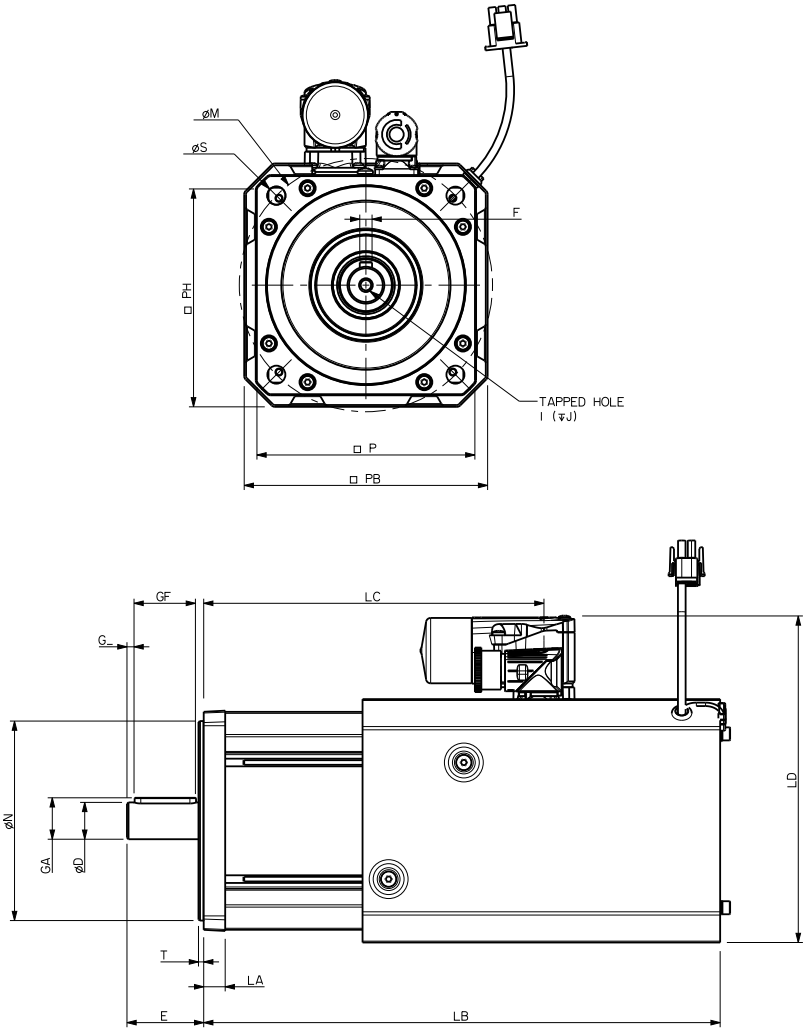
Optional connector height (mm)

Connector type	Overall height
	LD (± 1)
A	157.3
C	164.8
V	157.3
HYBRID	198.6

Frame Size 142

Motor frame size (mm)		142U5	
Voltage (Vrms)		380-480	
Frame length		D	E
Continuous stall torque (Nm)		24.0	34.9
Peak torque (Nm)		61.5	75.0
Standard inertia (kgcm2)		30.20	36.90
High Inertia (kgcm²)		43.10	49.80
Winding thermal time constant (sec)		205.6	249.3
Motor weight unbraked (kg)		17.6	20.7
Motor weight braked (kg)		19.3	22.5
Number of poles		6	6
Speed 3,000 (rpm)	Kt (Nm/A) =	1.60	
	Ke (V/krpm) =	98	
Rated torque (Nm)		20.1	25.6
Stall current (A)		15.0	21.8
Rated power(kW)		6.33	8.04
R (ph-ph) (Ohms)		0.7	0.50
L (ph-ph) (mH)		8.91	6.70
Recommended power conn' size		1.5	1.5
Speed 4,000 (rpm)	Kt (Nm/A) =	1.20	
	Ke (V/krpm) =	73.5	
Rated torque (Nm)		18.3	23.0
Stall current (A)		20.0	29.1
Rated power(kW)		7.67	9.63
R (ph-ph) (Ohms)		0.41	0.29
L (ph-ph) (mH)		5.06	3.97
Recommended power conn' size		1.5	1.5
Speed 6,000 (rpm)	Kt (Nm/A) =	0.80	
	Ke (V/krpm) =	49	
Rated torque (Nm)		13.0	15.0
Stall current (A)		30.0	43.6
Rated power(kW)		8.17	9.42
R (ph-ph) (Ohms)		0.16	0.13
L (ph-ph) (mH)		2.07	1.68
Recommended power conn' size		1.5	HYBRID

C6E001 Iss 25



Drawing number: IM/0736/GA Iss 4

Δt= 100 °C winding 40 °C maximum ambient

All data subject to ± 10 % tolerance

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20 °C ambient at 12 kHz drive switching frequency

All other figures relate to a 20 °C motor temperature

Maximum intermittent winding temperature is 140 °C

Motor dimensions (mm)

Note all dimensions shown are at nominal

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height (B)	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Fan housing	Mounting bolts
	LB (± 1)	LC (± 1)	LB (± 1)	LC (± 1)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 1)	P (± 0.2)	S (H14)	M	PH (± 0.6)	PB	
142D	366.5	251.7	426.5	311.7	14.0	3.4	130.0	212.8	142.0	12.0	165.0	143.0	158.60	M10
142E	396.5	281.7	456.5	341.7										

Output shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	D	E (± 0.45)	GA	GF (± 0.25)	G_ (± 1.1)	F	I	J (± 1)
D-E (Opt)	24.0	50.0	27.0	40.0	4.6	8.0	M8x1.25	20.0
D (Std)	28.0	60.0	31.0	50.0	4.6	8.0	M10x1.5	23.0
E (Std)	32.0	58.0	35.0	50.0	4.6	10.0	M12x1.75	29.0

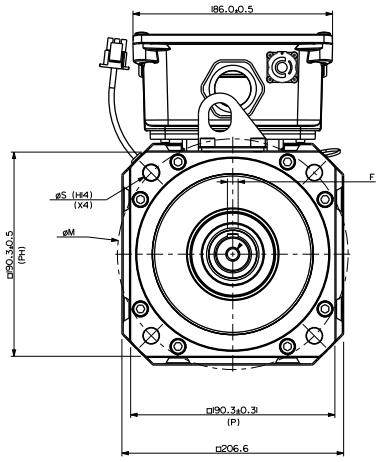
Optional connector height (mm)

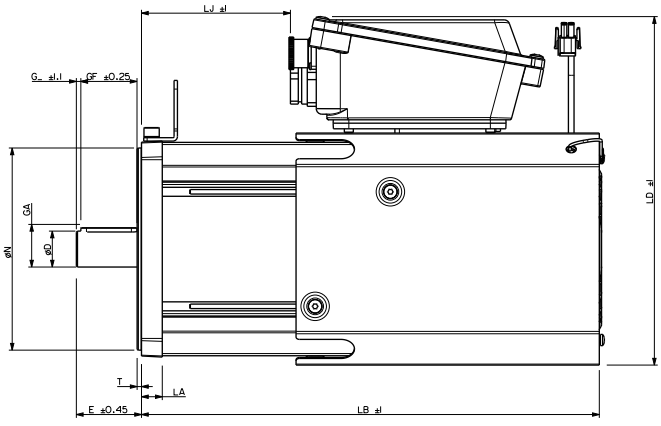
Connector type	Overall height
	LD (± 1)
M	192.3
HYBRID	225.6
B	191.8

Frame Size 190

Motor frame size (mm)		190U5	
Voltage (Vrms)		380-480	
Frame length		G	H
Continuous stall torque (Nm)		81.0	104.5
Peak torque (Nm)		213.0	231.0
Standard inertia (kgcm2)		142.30	160.80
High Inertia (kgcm²)		180.80	199.30
Winding thermal time constant (sec)		425.1	564.4
Motor weight unbraked (kg)		45.8	50.6
Motor weight braked (kg)		47.8	52.6
Number of poles		8	8
Speed 2,000 (rpm)	Kt (Nm/A) =	2.40	
	Ke (V/krpm) =	147	
Rated torque (Nm)		70.0	81.0
Stall current (A)		33.8	43.5
Rated power(kW)		14.66	16.96
R (ph-ph) (Ohms)		0.26	0.23
L (ph-ph) (mH)		6.89	6.30
Recommended power conn' size		1.5	HYBRID BOX SMALL
Speed 3,000 (rpm)	Kt (Nm/A) =	1.6	
	Ke (V/krpm) =	98	
Rated torque (Nm)		65.0	68.0
Stall current (A)		50.6	65.3
Rated power(kW)		20.42	21.36
R (ph-ph) (Ohms)		0.15	0.08
L (ph-ph) (mH)		3.06	2.42
Recommended power conn' size		HYBRID BOX SMALL	HYBRID BOX LARGE
Speed 4,000 (rpm)	Kt (Nm/A) =	1.2	
	Ke (V/krpm) =	73.5	
Rated torque (Nm)		49.0	52.3
Stall current (A)		67.5	87.1
Rated power(kW)		20.53	21.92
R (ph-ph) (Ohms)		0.11	0.06
L (ph-ph) (mH)		2.13	1.55
Recommended power conn' size		HYBRID BOX LARGE	HYBRID BOX LARGE

C6E001 Iss 25





Δt= 100 °C winding 40 °C maximum ambient

All data subject to ± 10 % tolerance

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20 °C ambient at 12 kHz drive switching frequency

All other figures relate to a 20 °C motor temperature

Maximum intermittent winding temperature is 140 °C

Drawing number: IM/0739/GA Iss 1

Motor dimensions (mm)

Note all dimensions shown are at nominal

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height (B)	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Fan housing	Mounting bolts
	LB (± 1)	LJ (± 1)	LB (± 1)	LI (± 1)	LA (± 0.5)	T	N (j6)	LD (± 1)	P (± 0.31)	S (H14)	M	PH (± 0.5)	PB	
190G S*	477.6	277.6	567.6	367.6	18.5	3.9	180.0	274.2	190.3	14.5	215.0	190.3	206.60	M12
190H S*	507.6	307.6	597.6	397.6										
190G L*	467.6	192.6	557.6	282.6				310.3						
190H L*	497.6	222.6	587.6	216.6										

Output shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	D	E (± 0.45)	GA	GF (± 0.25)	G_ (± 1.1)	F	I	J
G-H (Opt)	32.0	58.0	35.0	50.0	4.6	10.0	M12x1.75	29.0
G (Std)	38.0	58.0	41.0	50.0	4.6	10.0	M12x1.75	29.0
H (Std)	42.0	110.0	45.0	100.0	4.6	12.0	M16x2.0	37.0

Optional connector height (mm)

Connector type	Overall height
	LD (± 1)
N	260.8
M	240.3
J	260.8

Feedback selection

Feedback device order code	Feedback type	Manufacturer	Encoder supply voltage	SinCos cycle or incremental pulses per revolution	Resolution available to position loop[2&3]	Absolute multi-turn revolutions	Feedback accuracy[1]	Serial communication protocol
095-190 Motors								
AE	Resolver	Size 52	6 Vdc Excitation 6kHz	1 Transformation ratio 0.31	Medium 16384 (14 bits)	-	Low +/- 720”	
CA	Incremental Encoder	CFS50	5 Vdc ± 10%	4096	Medium 16384 (14 bits)	-	High +/- 60”	
EC (Multi-turn)	Inductive EnDat SinCos	EQI 1331	4.75 - 10 Vdc	32	High 5.24 x 10^5 (19 bits)	4096 (12 bits)	Medium +/- 380”	EnDat 2.2 / EnDat 01
FC (Single-turn)		ECI 1319				-		
RA (Multi-turn)	Optical Hiperface SinCos	SRM 50	7 - 12 Vdc	1024	High 1.04 x 10^6 (20 bits)	4096 (12 bits)	High +/- 52”	Hiperface
SA (Single-turn)		SRS 50				-		

[1] The information is supplied by the feedback device manufacturer and relates to it as a standalone device. The value may change when mounted into the motor and connected to a drive. These values have not been verified by Control Techniques.

[2] The output from the resolver is an analogue output; the resolution is determined by the analogue to digital converter used; the value shown is when the resolver is used in conjunction with the SM-Resolver.

[3] The sin and cosine outputs from the SinCos optical encoders are analogue outputs; with Unidrive M and Digitax ST the resolutions quoted above are when the encoder type is set to either SC Endat or SC Hiperface depending on the encoder.

Resolver

A resolver is an electrical transformer. It’s a passive wound device consisting of a stator and rotor elements which are excited from an external source, such as an SM-Resolver. The resolver produces two output signals that correspond to the Sine and CoSine angle of the motor shaft. This is a robust absolute device with low accuracy. It is capable of withstanding high temperature and high levels of vibration. Positional information is absolute within one turn, so the position is not lost when the drive is powered down.

Incremental Encoder

This electro mechanical device consists of a rotating disc, a light source and a light sensor. The rotating disc has a code track with a series of opaque and transparent sectors. As the disc rotates the light source shines onto the track, the change in opacity generates a pulse signal output and is converted into a digital signal. Two sequences of pulses determine direction and resolution is increased with additional tracks (x4). A marker pulse occurs once per revolution, used to zero the position count. The encoder provides commutation signals to determine the absolute position during the motor phasing test. This device is available as 4,096 pulse per revolutions (ppr). Positional information is non absolute, meaning the position is lost when the drive is powered down.

SinCos / Absolute Encoders

Types available are: Optical or Inductive - which can be single or multi-turn.

1) Optical
Similar to the incremental encoder method but positional information is absolute. This is a high resolution encoder which transmits information via a serial link, and Sine/CoSine signals with incremental feedback for speed control. This encoder provides commutation, speed regulation, and position control all in one device.

2) Inductive / Capacitive
An electronic device using inductively coupled PCBs, and works in a similar way to the resolver. It’s an absolute encoder with medium resolution (4,096 ppr) that uses a combination of absolute information transmitted via a serial link, and Sine/CoSine signals with incremental feedback for speed control. This encoder can be operated with the drive using either Sine/CoSine or absolute (serial) values only.

Multi-turn

Similar to the inductive encoder but with extra gear wheels included. This means the output is unique for each shaft position, removing the need to electrically store the position. The encoder has the additional ability to count complete turns of the motor shaft up to 4,096 ppr.

Brake Specification

Unimotor fm may be ordered with an internal rear mounted spring applied parking brake. The brake works on a failsafe principle. The brake is active when the supply voltage is switched off, and the brake is released when the supply voltage is switched on.

The standard parking brake is noted by the 5 code in the part number.

If a motor is fitted with a failsafe brake, take care not to subject the motor shaft to excessive torsional shocks or resonance when the brake is engaged or disengaged. Doing so can damage the brake.

Note: We recommend using an external diode (1N4001) if you want avoid switching peaks. This will help to protect solid state switches or reduce arcing at the brake relay contact. Please note that you will considerably increase the release time if you shunt the brake primary coil with an external diode.

Safety Note

The failsafe brake is for use as a holding brake with the motor shaft stationary.

Do NOT use it as a dynamic brake. Using it in this manner will cause brake wear and eventual failure. Emergency Stop situations can contribute to brake wear and failure.

Unimotor fm

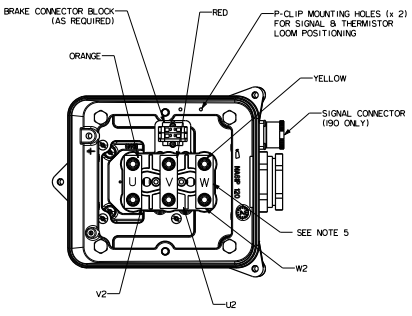
Motor frame	Supply volts	Input power	Static torque Parking Brake (5)	Release time	Moment of inertia	Backlash **
Size	Vdc	W	Nm	ms nom	kg.cm2*	Degrees **
095	24	16	12.2	60	0.39	0.75
115	24	23	20	126	0.21	0.75
142	24	23	20	126	0.21	0.75
190	24	25	67	120	4.95	0.77

*Note 1 kg.cm² = 1 x 10 - 4 kg.m² ** Backlash figure will increase with time

- The brake is intended for parking duty and is not for dynamic or safety use.
- Refer to your Automation Center or Distributor if your application requires dynamic braking in emergency conditions.
- To provide protection to the brake control circuit it is recommended that a diode is connected across the output terminals of the solid state or relay contacts devices.
- Larger torque brakes are available as on option. Contact your Automation Center or Distributor for details.
- Figures are shown at 20 °C brake temperature. Apply the derate factor of 0.9 to the high energy brake if motor temperature is above 100 °C.
- The brake will engage when power is removed.
- It is recommended to run extensive application validation testing and confirm the motor brake life span when the motor is mounted vertically and the motor runs through high acceleration and deceleration.

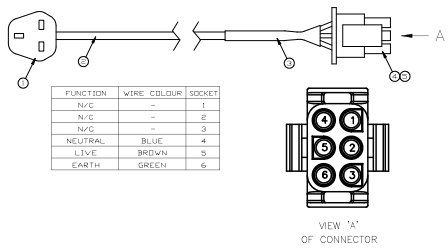
Motor connector details

Hybrid box



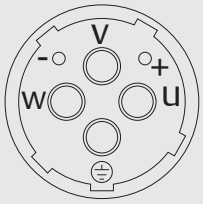
Unimotor fm Fan Blown motors:	Clearance distance behind fan box:	Voltage	Free Air flow:	Fan Current rating:
095 fm motor	40mm	230V AC	67 m³/h	0.05A
115 fm motor	40mm	230V AC	160 m³/h	0.08A
142 fm motor	50mm	230V AC	180 m³/h	0.07A
190 fm motor	60mm	230V AC	325 m³/h	0.13A

AMP connector



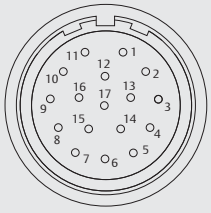
Power plug

Size 1	With brake	Without brake
Pin	**Function**	**Function**
1	Phase U (R)	Phase U (R)
2	Phase V (S)	Phase V (S)
3	Ground	Ground
4	Phase W (T)	Phase W (T)
5	Brake	
6	Brake	
Shell	Screen	Screen

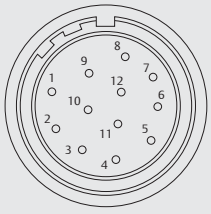


Size 1.5	With brake	Without brake
Pin	**Function**	**Function**
U	Phase U (R)	Phase U (R)
V	Phase V (S)	Phase V (S)
⏚	Ground	Ground
W	Phase W (T)	Phase W (T)
+	Brake	
-	Brake	
Shell	Screen	Screen

Signal plug



	Incremental encoder (CA)	Heidenhain Sincos absolute encoders (EC,FC,EB,FB)
Pin	**Function**	**Function**
1	Thermistor	Thermistor
2	Thermistor	Thermistor
3		Screen (Optical only)
4	S1	
5	S1 Inverse	
6	S2	
7	S2 Inverse	
8	S3	+ Clock
9	S3 Inverse	- Clock
10	Channel A	+ Cos
11	Index	+ Data
12	Index Inverse	- Data
13	Channel A Inverse	- Cos
14	Channel B	+ Sin
15	Channel B Inverse	- Sin
16	+ V	+ V
17	0 Volts	0 Volts
Body	Screen	Screen



Resolver (AE)	SICK Sin/Cos encoders (RA,SA)
Function	**Function**
Excitation High	REF Cos
Excitation Low	+ Data
Cos High	- Data
Cos Low	+ Cos
Sin High	+ Sin
Sin Low	REF Sin
Thermistor	Thermistor
Thermistor	Thermistor
	Screen
	0 Volts
	-
	+ V
	Screen

CONTROL TECHNIQUES™

www.controltechniques.com

Connect with us at:

LinkedIn - Nidec Control Techniques

twitter.com/Nidec_CT

facebook.com/NidecControlTechniques

youtube.com/c/nideccontroltechniques

theautomationengineer.com (blog)

THE AUTOMATION ENGINEER

Nidec

All for dreams

Nidec Control Techniques Limited. Registered Office: The Gro, Newtown, Powys SY16 3BE. Registered in England and Wales. Company Reg. No. 01236886.

P.N. 0702-0021-01 04/18