CONTROL TECHNIQUES
DYNAMICS

SERVO MOTOR SERIES

UNIMOTOR FM
FAN BLOWN

AC brushless servo motor

095 to 190 Frames
10.3 to 104.5 Nm
(231 Nm Peak)

Nidec
All for dreams

Unimotor fm - Fan Blown

Unimotor fm - fan blown is a high performance brushless AC servo motor range designed for use in demanding continuous duty applications. The motors are available in four frame sizes with various mounting arrangements and motor lengths.

Reliability and innovation

Unimotor fm is designed using a proven development process that prioritizes innovation and reliability. This process has resulted in a market leading reputation for both performance and quality.

Matched motor and drive combinations

Drives and motors from Control Techniques are designed to function as an optimized system. Unimotor fm is the perfect partner for Unidrive M and Digitax ST.

Faster set-up, optimized performance

When a Control Techniques servo drive is connected to a Unimotor fm fitted with a SinCos or Absolute encoder, it can recognize and communicate with the motor to obtain the "electronic nameplate" data. This motor data can then be used to automatically optimize the drive settings. This feature simplifies commissioning and maintenance, ensures consistent performance and saves time.

Accuracy and resolution to suit your application requirements

Choosing the right feedback device for your application is critical in getting optimum performance. Unimotor fm has a range of feedback options that offer different levels of accuracy and resolution to suit most applications:

- 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

Unimotor fm is an ideal retrofit choice with features to ensure it can integrate easily with your existing servo motor applications. Unimotor fm has been designed so that existing Unimotor customers can easily migrate to the new platform. All connector interface types and mounting dimensions remain the same. If you are planning to retrofit your system, Unimotor fm is the obvious choice.

Custom built motors

As part of our commitment to you, we can design special products to meet your application specific requirements.

Custom built motors are identified by the code -S*** added to the end of the part number and can include 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

Features

Unimotor fm - fan blown is suitable for a wide range of industrial applications, due to it's extensive range of features:

- Torque range from 10.3 Nm to 104.5 Nm
- High energy parking brakes
- Numerous connector variants, including: vertical, 90° low profile, 90° rotatable and hybrid box on frame size 190
- Variety of flange possibilities (IEC/NEMA)
- Various shaft diameters; keyed or plain
- IP65 conformance; sealed against water spray and dust when mounted and connected
- Low inertia for high dynamic performance; high inertia option available
- World class performance
- Winding voltage for inverter supply of 400 V
- Rated speeds from 2,000 to 6,000 rpm and others available
- Thermal protection by PTC thermistor/optional KTY84.130 sensor

CONTROL TECHNIQUES

DRIVE OBSESSED SINCE 1973

Drives: they're what we do. Whether you're designing a new machine or installing a replacement, we know you need quick delivery and an easy set up, with the confidence that your drive's going to keep on performing with accurate control.

So leave it to the specialists. We've dedicated ourselves to designing and manufacturing variable speed drives since 1973. This means quick set up, high reliability, maximum motor control and fast, efficient service.

1,000+ OEM CUSTOMERS

5M+ INSTALLED DRIVES

1,400+ EMPLOYEES

70 COUNTRIES

Outstanding performance

The outstanding performance of our drives is the fruit of over 45 years of engineering experience in drive design..

Technology you can rely on

Robust design and the highest build quality ensure the enduring reliability of the millions of drives installed around the world.

Open design architecture

Based on open design architecture, our drives integrate with all primary communication protocols.

Embedded intelligence

Precision motor control is combined with high performance embedded intelligence, ensuring maximum productivity and efficiency of your machinery.

Global reach, local support

Highly experienced, locally based Application Engineers design and support drive technology to provide maximum value, wherever you are in the world.

A part of the Nidec Group

Unimotor fm fan blown motors

In many instances you may need more performance across the torque range. We've modified the electromagnetic construction of 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	10.3 11.9					9
115	115		17.0 22.1				10
142	165			24.0 34.9			11
190	215				81.0 104.5		12
Stall	10	12	20	35	85	105	Nm

Conformance and standards

Ordering information

Use the information below in the illustration to create an order code for a Unimotor fm fan blown.

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** = Parking brake (fibre)	
142			**115 frame**	**60** = 6000 rpm	**6** = Parking brake (resin)*	**C** = Power 90° rotatable and signal vertical
190			**D**	**115 frame**	**X** = Special	
			E	**30** = 3000 rpm	*not available on 142 or 190 frame	**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		**Hybrid box**
				30 = 3000 rpm		**H** = Power hybrid box
				40 = 4000 rpm		

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	ECN 1313				**28.0**	D	Std
	EF = Inductive EnDat Multi-turn FS	EQI 1331FS				**32.0**	E	Std
	FF = Inductive EnDat Single-turn FS	ECI 1319FS		**190 frame only**				
				215	Std	**32.0**	G-H	Opt
						38.0	G	Std
						42.0	H	Std

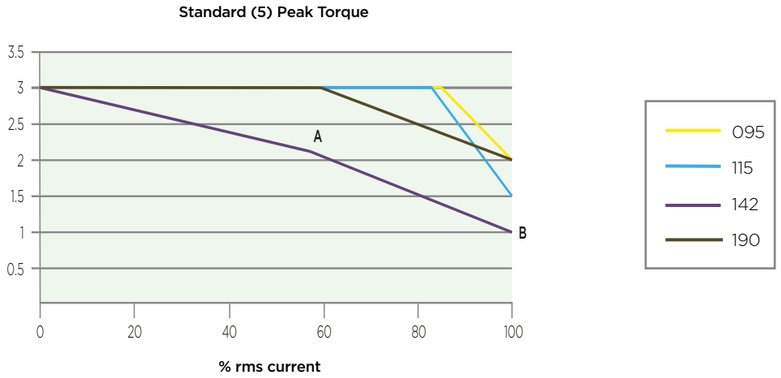
[1] 142 and 190 frame motors the Power plug will be size 1.5
[2] PTC thermistor = DIN44082
[3] KTY thermistor = KTY84

Peak torque information

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	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

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 = 75.0 Nm
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 = 34.9 Nm

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

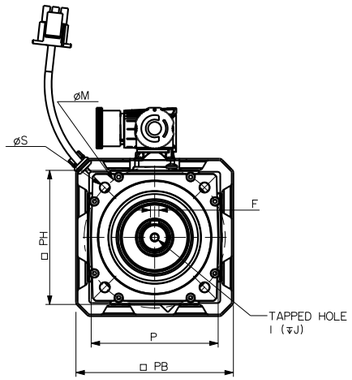
IP54 – The fan motor and circuit board are coated to protect them against splash water and humidity.

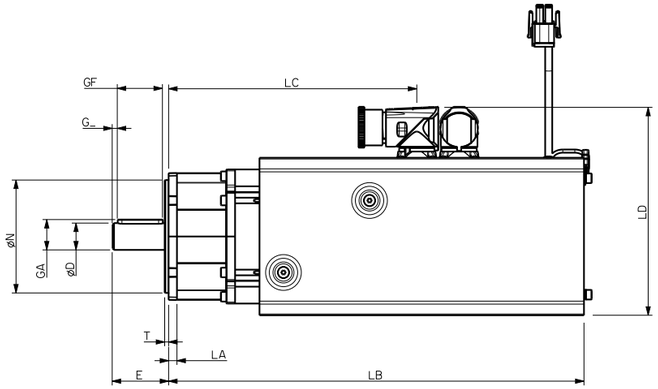
Complete Unimotor fm fan blown motor assembly

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
Standard Motor weight (kg)		8.2	9.4
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)		3.16	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





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 Intermittant 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)

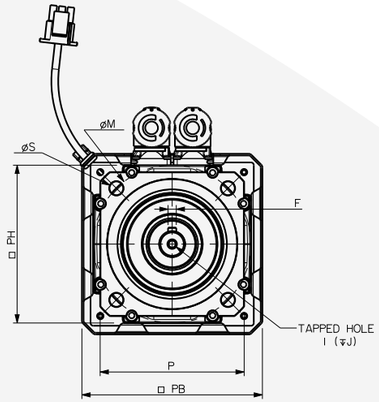
	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	D	E (± 0.45)	GA	GF (± 0.25)	G_ (± 1.1)	F	I	J (± 1)
095D-E (Opt)	19.0	40.0	21.5	32.0	3.6	6.0	M6 x 1.0	17.0
095D-E (Std)	22.0	50.0	24.5	40.0	4.6	6.0	M8 x 1.25	20.0

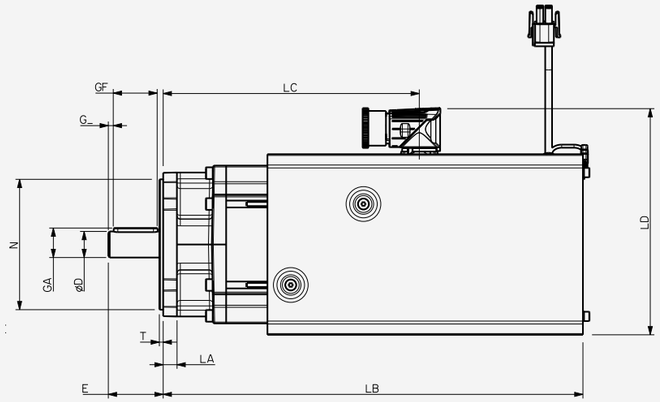
Optional connector height (mm)

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)		12.5	14.8
High Inertia (kgcm²)		17.1	19.4
Winding thermal time constant (sec)		127.4	141.5
Standard Motor weight (kg)		12.6	14.5
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)		1.53	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	0.68
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	0.3.1
L (ph-ph) (mH)		3.07	2.46
Recommended power conn' size		HYBRID ONLY	





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 Intermittant 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)

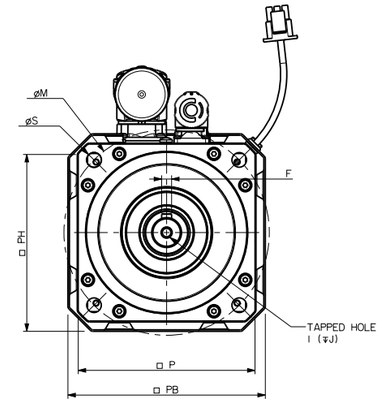
	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	D	E (± 0.45)	GA	GF (± 0.25)	G_ (± 1.1)	F	I	J (± 1)
115D (Std)	24.0	50.0	27.0	40.0	4.6	8.0	M8 x 1.25	20.0
115E (Std)	28.0	60.0	31.0	50.0	4.6	8.0	M10 x 1.5	23.0

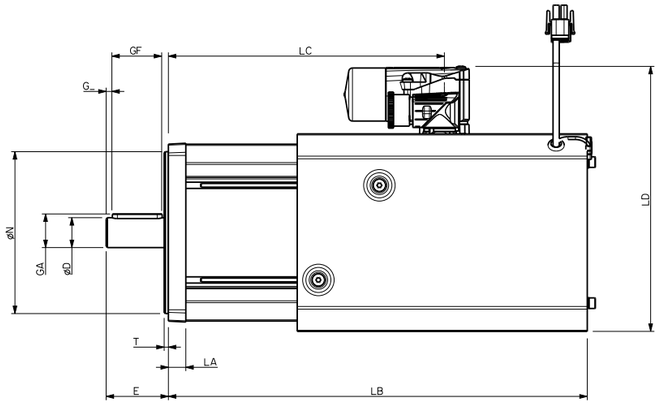
Optional connector height (mm)

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)		30.2	36.9
High Inertia (kgcm²)		43.1	49.8
Winding thermal time constant (sec)		205.6	249.3
Standard Motor weight (kg)		17.6	20.7
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)		0.70	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





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 Intermittant 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 (J)	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)

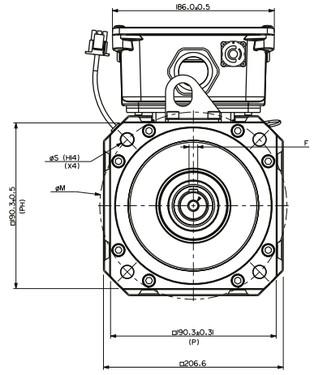
	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	D	E (± 0.45)	GA	GF (± 0.25)	G_ (± 1.1)	F	I	J (± 1)
142D-E (Opt)	24.0	50.0	27.0	40.0	4.6	8.0	M8 x 1.25	20.0
142D (Std)	28.0	60.0	31.0	50.0	4.6	8.0	M10 x 1.5	23.0
142E (Std)	32.0	58.0	35.0	50.0	4.6	10.0	M12 x 1.75	29.0

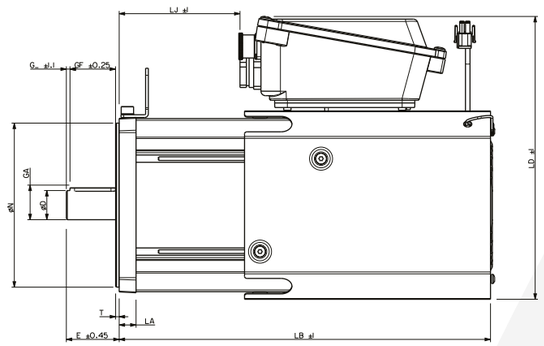
Optional connector height (mm)

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)		142.3	160.8
High Inertia (kgcm²)		180.8	199.3
Winding thermal time constant (sec)		425.1	564.4
Standard Motor weight (kg)		45.8	50.6
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) =	1.60	
	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	HYRBID BOX LARGE
Speed 4,000 (rpm)	Kt (Nm/A) =	1.20	
	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





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 Intermittant 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 (H)	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
190G-H (Opt)	32.0	58.0	35.0	50.0	4.6	10.0	M12 x 1.75	29.0
190G (Std)	38.0	58.0	41.0	50.0	4.6	10.0	M12 x 1.75	29.0
190H (Std)	42.0	110.0	45.0	100.0	4.6	12.0	M16 x 2.0	37.0

Optional connector height (mm)

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

Additional Motor Weights

Additional motor weight information (kg)																							
Motor Frame Size	095					115					142					190							
Frame Length	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	F	G	H
Braked '5' Brake	+0.6					+1.2					+1.7					+3.5							
Braked '6' Brake	+1.4					+1.78					+2.28												
High Inertia	+0.51					+0.94					+1.68					+2.25							
Fan Box	+1.35					+1.65					+1.9					+2.6							
Hybrid Box Small	+0.5					+0.5					+0.5												
Hybrid Box Large																+1.5							

Note: All motor weights approximate to ± 10%. Can differ depending on winding, connector and feedback type, PCD and output shaft size.

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	Frame size
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 2.1 / EnDat 01	-
FC (Single-turn)		ECI 1319				-			
EF (Multi-turn)	Inductive EnDat Functional Safety	EQI 1331 FS	3.60 - 14 Vdc	Serial Only	High 5.24 x 10^5 (19 bits)	4096 (12 bits)	High +/- 65"	EnDat 2.2 / EnDat 22	-
FF (Single-turn)		ECI 1319 FS				-			-
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				-			
EB (Multi-turn)	Optical EnDat SinCos	EQN 1325	3.6 - 14 Vdc	2048	High 2.08 x 10^6 (21 bits)	4096 (12 bits)	Very High +/- 20"	EnDat 2.1 / EnDat 01	-
FB (Single -turn)		ECN 1313				-			

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.

Feedback terminology

Resolver

A passive wound device consisting of a stator and rotor elements 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 of low accuracy, capable of withstanding high temperature and high levels of vibration. Positional information is absolute within one turn - i.e. position is not lost when the drive is powered down.

Incremental encoder

An electronic device using an optical disc. The position is determined by counting steps or pulses. Two sequences of pulses in quadrature are used so the direction sensing may be determined and 4x (pulses per rev) may be used for resolution in the drive. A marker pulse occurs once per revolution and is used to zero the position count. The encoder also provides commutation signals, which are required to determine the absolute position during the motor phasing test. This device is available in 4096, 2048 and 1024 ppr versions. Positional information is non absolute - i.e. 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

An electronic device using an optical disc. An absolute encoder with high resolution that employs a combination of absolute information, transmitted via a serial link, and Sine/CoSine signals with incremental techniques.

2) Inductive / Capacitive

An electronic device using inductively coupled PCBs. An absolute encoder with medium resolution that employs a combination of absolute information, transmitted via a serial link, and Sine/CoSine signals with incremental techniques. This encoder can be operated with the drive using either Sine/CoSine or absolute (serial) values only. Positional information is absolute within 4096 turns - i.e. position is not lost when the drive is powered down.

Multi-turn

As previous but with extra gear wheels included so that the output is unique for each shaft position and the encoder has the additional ability to count complete turns of the motor shaft up to 4096 revolutions

Sensorless

Synchronous Rotor Flux Control. Recommended for use on the fm motor range. The motor performance will be limited when operating at low speed when using high frequency injection mode. When using closed loop vector mode the motor performance will be as stated in the ratings tables.

Environment

The environment is the external conditions that physically surround the Feedback device. The main factors that affect the feedback device are temperature and mechanical shock and vibration.

Motors are designed to allow the feedback devices to be within their operational temperature limits. Generally it is assumed that there is free air movement around the motor. If the motor is positioned where there is little or no airflow or it is connected to a heat source such as a gearbox, it can cause the air temperature around the feedback device to be operating outside its recommended operating temperature and can lead to problems.

Mechanical shock and vibration tends to be transmitted from the load through the motor shaft and into the feedback device. This should be considered when the motor and feedback device are being specified for the application.

Position

The defined position is the location in a coordinate system which is usually in two or more dimensions.

For a rotary feedback device this is defined as the location within one revolution. If it is a multi-turn device it is the location within one revolution plus the location within a number of rotations.

For a linear feedback device this is defined as the distance from a known point.

Resolution

The resolution of a feedback device is the smallest change in position or angle that it can detect in the quantity that it is measuring.

Feedback resolution of the system is a function of the type of feedback device used and drive receiving the information.

Generally, as the resolution of the feedback device increases the level of control that can be used in the servo system increases.

As with accuracy, as the resolution of the device increases the cost increases.

Accuracy

Accuracy is the measure of the difference between the expected position and actual measured value. Rotary feedback accuracy is usually given as an angle representing the maximum deviation from the expected position. Linear feedback accuracy is usually given as a distance representing the maximum deviation from the expected.

Generally, as the accuracy increases the cost of the feedback device increases.

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.

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.

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.

Note: Shunting the brake primary coil with an external diode to avoid switching peaks increases the release time considerably. This is usually required to protect solid state switches, or to reduce arcing at the brake relay contacts (Diode 1N4001 recommended)

"Resin" Friction Material Application & Benefits:

- The main feature change to the type 6 brake is the use of an improved Resin friction material compared to its predecessors.
- The type 6 brake has improved overall performance in operation compared to the aluminium cored friction materials containing natural rubber.
- Type 6 brakes can endure higher interface temperatures and pressures.
- Type 6 brake disk are moulded as a one-piece part providing better tensile, compressive & impact qualities compared to other friction materials.

Unimotor fm

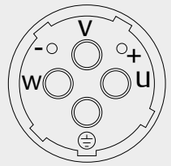
Motor frame	Supply volts	Input power	Static torque	Release time	Moment of inertia	Backlash **
			Parking Brake (5)			
Size	Vdc	W	Nm	ms nom	kg.cm²*	Degrees **
095	24	16	12.2	60	0.39	0.75
115	24	23	20	126	0.21	0.75
142	24	23	20	126	0.21	0.75
190	24	25	67	120	4.95	0.77

Motor frame	Supply volts	Input power @ 20 °C	Static torque	Release time	Moment of inertia	Backlash **
			Parking Brake (6)			
Size	Vdc	W	Nm	ms nom	kg.cm²*	Degrees **
095	24	18.0	10	64	0.153	1.25°
115	24	23.0	16	tba	0.413	0.38°

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

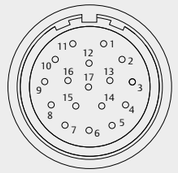
The brake is intended for parking duty and is not for dynamic or safety use.
Refer to your Automation Center or Distributor if your application requires dynamic braking in emergency conditions.
To provide protection to the brake control circuit it is recommended that a diode is connected across the output 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.

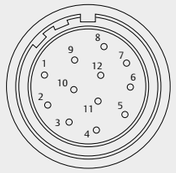
POWER PLUG - Motor end



Size 1			Size 1.5		
	With brake	Without brake		With brake	Without brake
Pin	Function	Function	Pin	Function	Function
1	Phase U (R)	Phase U (R)	U	Phase U (R)	Phase U (R)
2	Phase V (S)	Phase V (S)	V	Phase V (S)	Phase V (S)
3	Ground	Ground	⏚	Ground	Ground
4	Phase W (T)	Phase W (T)	W	Phase W (T)	Phase W (T)
5	Brake		+	Brake	
6	Brake		-	Brake	
Shell	Screen	Screen	Shell	Screen	Screen

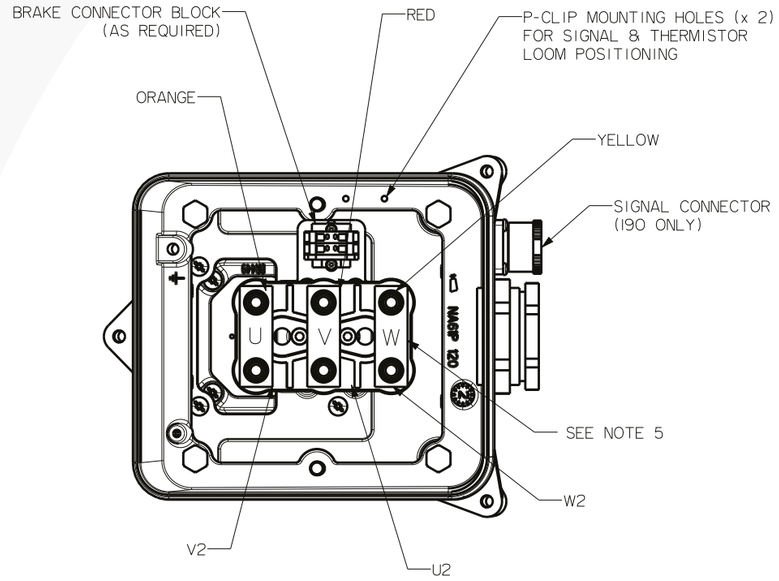
SIGNAL PLUG - Motor end





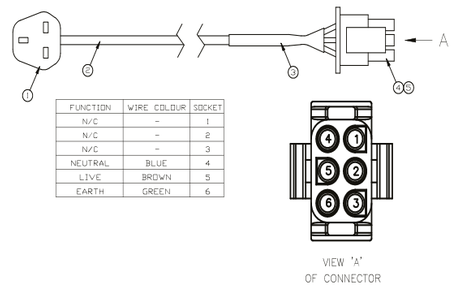
	SI		SE	SR	SS
	Incremental encoder (CA)	Heidenhain Sincos EnDat 2.1 absolute encoders (EC, FC, EB, FB)	Heidenhain EnDat 2.2 only absolute encoders (EF, FF)	Resolver (AE,	SICK SinCos Hiperface encoders (RA, SA)
Pin	Function	Function	Function	Function	Function
1	Thermistor	Thermistor	Thermistor	Excitation High	REF Cos
2	Thermistor	Thermistor	Thermistor	Excitation Low	+ Data
3		Screen (Optical only)	Screen (Optical only)	Cos High	- Data
4	S1			Cos Low	+ Cos
5	S1 Inverse			Sin High	+ Sin
6	S2			Sin Low	REF Sin
7	S2 Inverse			Thermistor	Thermistor
8	S3	+ Clock	+ Clock	Thermistor	Thermistor
9	S3 Inverse	- Clock	- Clock		Screen
10	Channel A	+ Cos			0 Volts
11	Index	+ Data	+ Data		-
12	Index Inverse	- Data	- Data		+ V
13	Channel A Inverse	- Cos			
14	Channel B	+ Sin			
15	Channel B Inverse	- Sin			
16	+ V	+ V	+ V		
17	0 Volts	0 Volts	0 Volts		
Body	Screen	Screen	Screen		Screen

Hybrid Box



AMP Connector

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



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