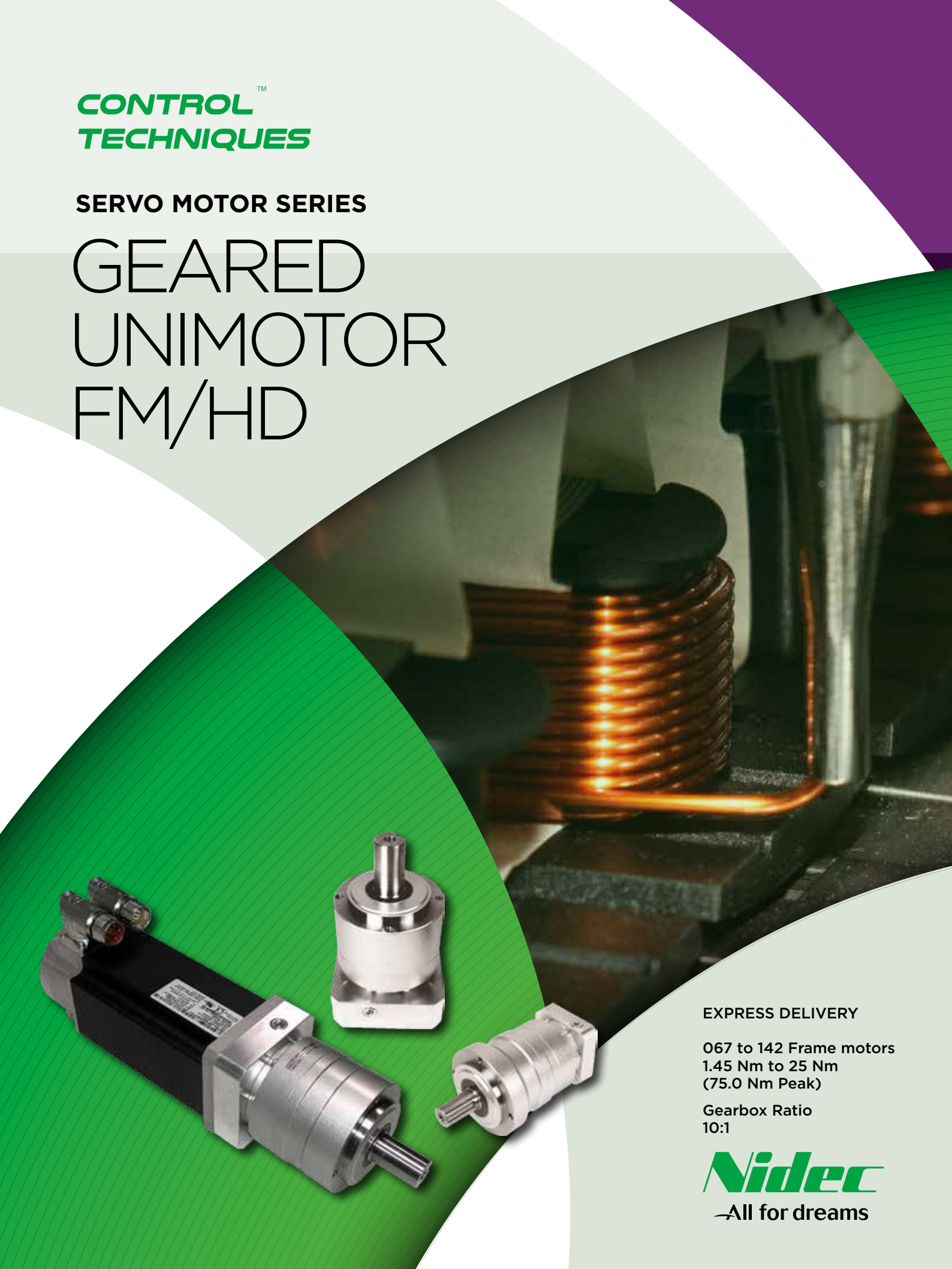
CONTROL TECHNIQUES™

SERVO MOTOR SERIES

GEARED UNIMOTOR FM/HD



EXPRESS DELIVERY

067 to 142 Frame motors
1.45 Nm to 25 Nm
(75.0 Nm Peak)

Gearbox Ratio
10:1

Nidec
All for dreams

Geared Unimotor fm/hd

Geared Unimotor combines high performance brushless AC servo motors along with in-line planetary gearboxes both designed for use in demanding continuous duty applications. The motors are available in six frame sizes, across the fm and hd range, with a wide selection of gearboxes.

Reliability and innovation

Geared Unimotor fm/hd motors are 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, gearbox and drive combinations

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

Accuracy and resolution to suit your application requirements

Choosing the right feedback device for your application is critical in getting optimum performance. Geared Unimotor fm/hd 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

Faster set-up, optimized performance

When a Control Techniques servo drive is connected to a Geared Unimotor fm/hd motor 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.

Ideal for retrofit

Geared Unimotor is an ideal retrofit choice with features to ensure it can integrate easily with your existing servo motor applications. Geared Unimotors have 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, Geared Unimotors are the obvious choice.

Wide range of accessories

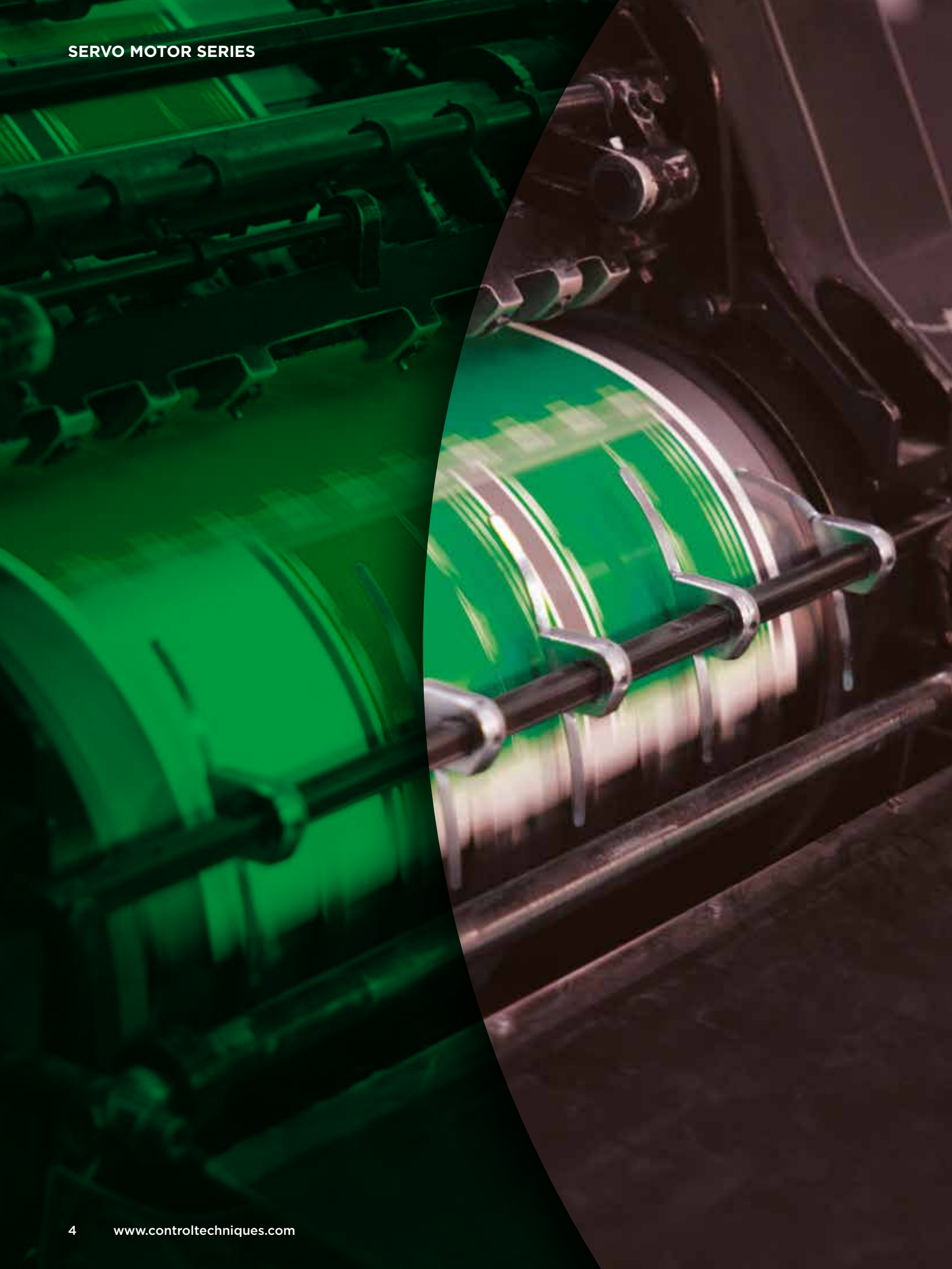
In addition we offer a range of accessories to cover your system requirements:

- Fan boxes
- Gearbox adaptor plates
- Cable connectors

Features

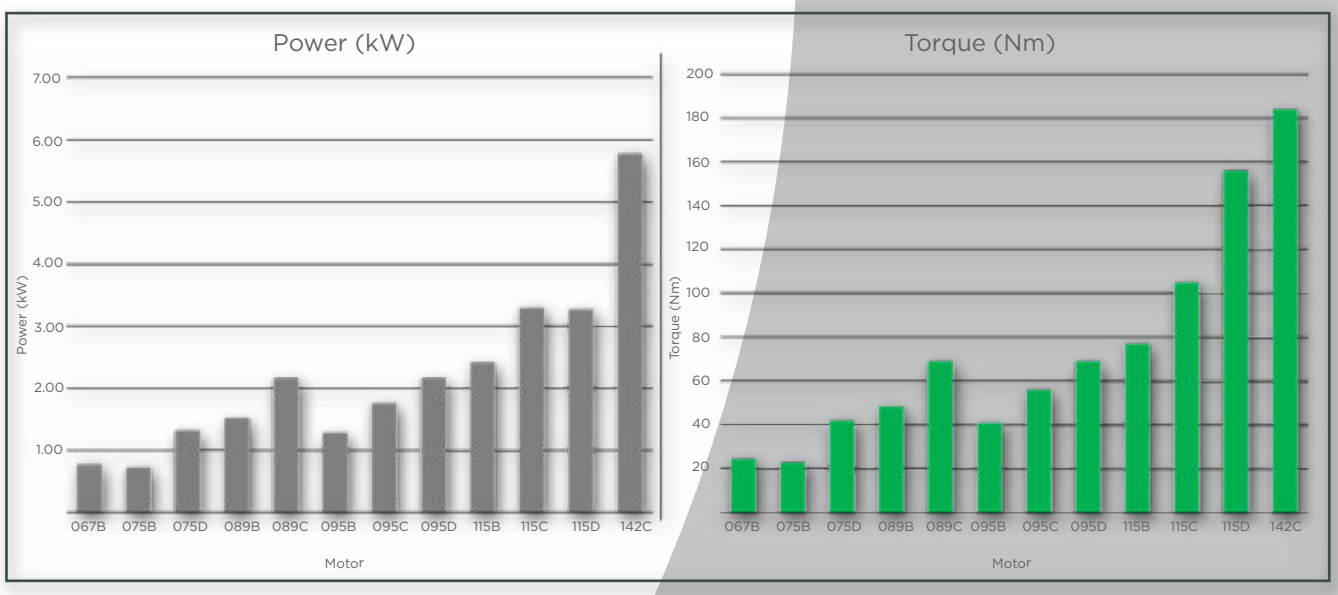
Geared Unimotor fm/hd motors are suitable for a wide range of industrial applications, due to the extensive range of features:

- Torque range: from 1.25 Nm to 25 Nm
- High torque to inertia ration for high dynamic performance (hd)
- Compact but powerful
- High energy dissipation parking brakes
- IP65 conformance; sealed against water spray and dust when mounted and connected
- Segmented stator design (hd)
- World class performance
- Supported by rigorous testing for performance and reliability
- Rated speeds of 2,000 & 3,000 rpm and others available
- Thermal protection by PTC thermistor/optional KTY84.130 sensor



Geared Unimotor fm/hd motors

Quick reference table



Conformance and standards

Ordering information – D + 10 lead time

Use the information below in the table to create an order code for a **Geared Unimotor hd**.

089	UD	B	30	0	B
Frame size	**Motor voltage**	**Stator length**	**Rated speed**	**Brake**	**Connection type**
	067 – 142 frame	**067 frame**	**067 – 142 frame**	**067 – 142 frame**	**Size 1**
067		**B**	**30** = 300 rpm	**0** = Not fitted (Std)	**B** = Power and signal 90° rotatable
089		**089 frame**		**5** = Parking brake (fibre)[1]	
115		**B / C**		**6** = Parking brake (resin)[2]	
142	**UD** = 400 V	**115 frame**			
		B / C / D		[1] **5 brake ONLY available on 142 frame**	
		142 frame		[2] **6 brake NOT available on 142 frame**	
		C			

Use the information below in the table to create an order code for a **Geared Unimotor fm**.

075	U3	B	30	0	B
Frame size	**Motor voltage**	**Stator length**	**Rated speed**	**Brake**	**Connection type**
	075 – 095 frame	**075 frame**	**075 – 095 frame**	**075 – 095 frame**	**Size 1**
075		**B / D**	**30** = 300 rpm	**0** = Not fitted (Std)	**B** = Power and signal 90° rotatable
095	**U3** = 400 V	**095 frame**		**6** = Parking brake (resin)	
		B / C / D			**C** = Power 90° rotatable and signal vertical
					V = Power and signal vertical

NOTE.

Other geared motors are available on request but may increase motor lead time.
Please check before ordering.

Gearboxes are not to be sold seperately.

A	CA		A	080220	GSAI	
Output shaft	**Feedback device**		**Inertia**	**Gearbox PCD/ Shaft**	**Gearbox code** (10:1 ratio)	
067 - 142 frame	**067 frame**		**067 - 142 frame**	**067 frame**		
A = Key	**AR** = Resolver		**A** = Standard + PTC[1]	**062160**	**GSAC**	VRL-070B
	CR = Incremental Encoder	R35i		**067 - 089 frame**		
	EM = Inductive EnDat SinCos Multi-turn	EQI 1130		**080220**	**GSAI**	VRL-090B
	089 - 142 frame			**089 - 115 frame**		
	AE = Resolver			**108320**	**GSAO**	VRL-120B
	CA = Incremental Encoder	CFS50		**115 - 142 frame**		
	EC = Inductive EnDat SinCos Multi-turn	EQI 1331		**140400**	**GSAU**	VRL-155B
	EB = Optical EnDat SinCos Single-turn	EQN 1325		**142 frame**		
	RA = Optical Hiperface SinCos Multi-turn	SRM 50		**184550**	**GSBA**	VRL-205B

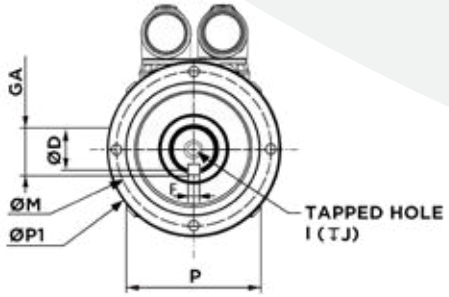
A	CA		A	080220	GSAI	
Output shaft	**Feedback device**		**Inertia**	**Gearbox PCD/ Shaft**	**Gearbox code** (10:1 ratio)	
075 - 095 frame	**075 - 095 frame**		**075 - 095 frame**	**075 frame**		
A = Key	**AE** = Resolver		**A** = Standard + PTC	**062160**	**GSAC**	VRL-070B
	CA = Incremental Encoder	CFS50	**B** = High + PTC	**075 - 095 frame**		
	EC = Inductive EnDat SinCos Multi-turn	EQI 1331		**080220**	**GSAI**	VRL-090B
	FC = Inductive EnDat SinCos Single-turn	ECI 1319		**095 frame**		
	RA = Optical Hiperface SinCos Multi-turn	SRM 50		**108320**	**GSAO**	VRL-120B

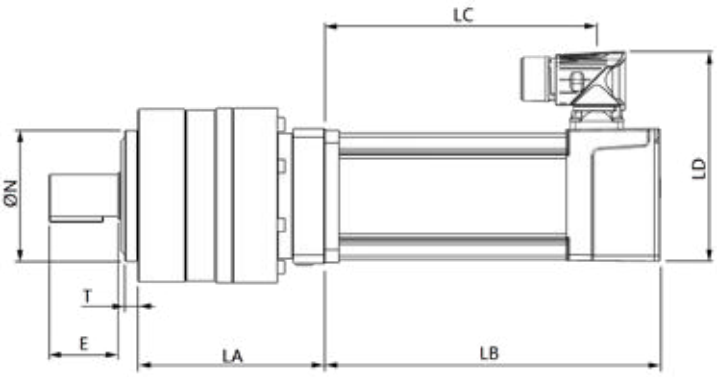
[1] PTC thermistor = DIN44082

Geared motor ratings

Frame size 067 (hd)

Motor frame size (mm)		067UD	
Voltage (Vrms)		380-480	
Frame length		B	
Gearbox		GSAC	GSAI
Continuous stall torque (Nm)		24.23	24.23
Peak torque (Nm)		35.0	72.68
Standard inertia (kg cm²)		0.17	0.30
Winding thermal time constant (sec)		61.0	61.0
Standard weight (kg)		4.06	6.06
Number of poles		10	10
Speed 300 (rpm)	Kt (Nm/A) = Ke (V/krpm) =	1.6 98	
Rated torque (Nm)		18.0	23.28
Stall current (A)		1.59	1.59
Rated power (kW)		0.77	0.77
R (ph-ph) (Ohms)		15.2	15.2
L (ph-ph) (mH)		54.2	54.2
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
12kHz drive switching frequency
All other figures relate to a 20°C motor temperature.
Maximum intermittent winding temperature is 140°C

Geared motor dimension (mm) **GSAC** - VRL070B 10:1

	Feedback AR, CR, EM				Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox diameter
	Unbraked length		Braked length								
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
067B	172.9	139.0	207.9	174.0	84.0	3.0	52.0	111.5	70.0	62.0	70.0

Geared motor shaft dimensions (mm)

Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 1)
16.0	26.0	18.0	22.0	5.0	M5	12.5

Geared motor dimension (mm) **GSAI** - VRL090B 10:1

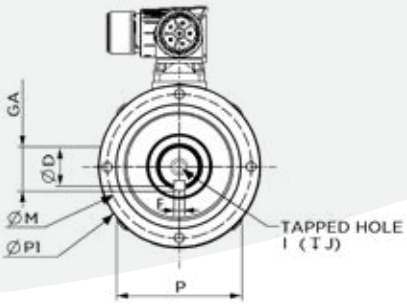
	Feedback AR, CR, EM				Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox diameter
	Unbraked length		Braked length								
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
067B	172.9	139.0	207.9	174.0	97.0	3.0	68.0	111.5	70.0	80.0	90.0

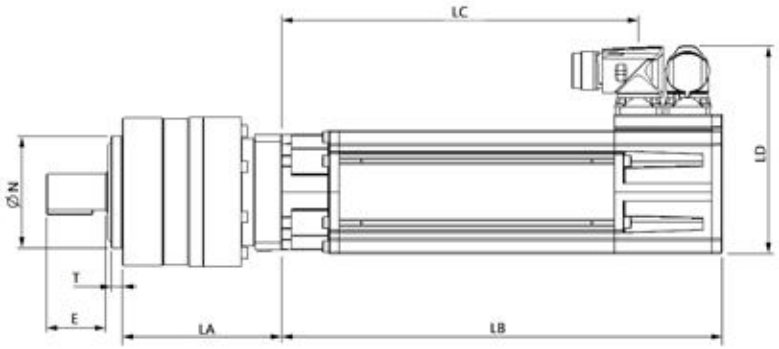
Geared motor shaft dimensions (mm)

Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 1)
22.0	36.0	24.5	28.0	6.0	M8	19.0

Frame size 075 (fm)

Motor frame size (mm)		075U3			
Voltage (Vrms)		380-480			
Frame length		B	D	B	D
Gearbox		GSAC		GSAI	
Continuous stall torque (Nm)		25.65	44.65	25.65	44.65
Peak torque (Nm)		35.0	39.0	76.0	80.0
Standard inertia (kg cm²)		1.22	2.07	1.22	2.07
High inertia (kg cm²)		1.61	2.03	1.61	2.03
Winding thermal time constant (sec)		58.0	73.0	58.0	73.0
Standard weight (kg)		5.18	5.98	7.18	7.98
Number of poles		6	6	6	6
Speed 300 (rpm)	Kt (Nm/A) = Ke (V/krpm) =	1.6 98			
Rated torque (Nm)		18.0	36.05	21.85	39.9
Stall current (A)		1.7	2.9	1.7	2.9
Rated power (kW)		0.72	1.31	0.72	1.31
R (ph-ph) (Ohms)		21.07	7.81	21.07	7.81
L (ph-ph) (mH)		52.65	23.89	52.65	23.89
Recommended power conn' size		1	1	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
12kHz drive switching frequency
All other figures relate to a 20°C motor temperature.
Maximum intermittent winding temperature is 140°C

Geared motor dimension (mm) **GSAC** - VRL070B 10:1

	Feedback AE, CA, EC, FC, RA				Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox Diameter
	Unbraked length		Braked length								
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
075B	238.2	187.2	268.2	217.2	84.0	3.0	52.0	126.0	70.0	62.0	70.0
075D	298.2	247.2	328.2	277.2							

Geared motor shaft dimensions (mm)

Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 1)
16.0	26.0	18.0	22.0	5.0	M5	12.5

Geared motor dimension (mm) **GSAI** - VRL090B 10:1

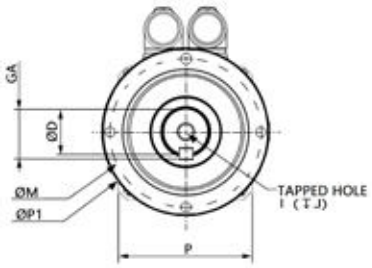
	Feedback AE, CA, EC, FC, RA				Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox Diameter
	Unbraked length		Braked length								
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
075B	238.2	187.2	268.2	217.2	97.0	3.0	68.0	126.0	70.0	80.0	90.0
075D	298.2	247.2	328.2	277.2							

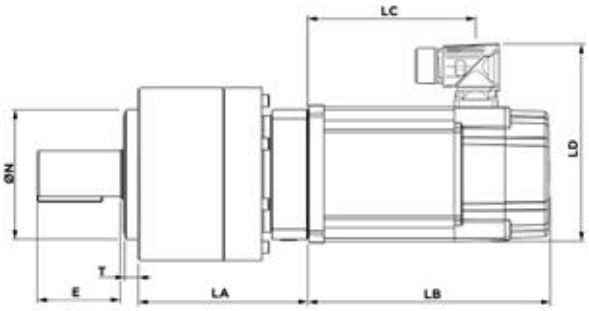
Geared motor shaft dimensions (mm)

Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 1)
22.0	36.0	24.5	28.0	6.0	M8	19.0

Frame size 089 (hd)

Motor frame size (mm)		089UD			
Voltage (Vrms)		380-480			
Frame length		B	C	B	C
Gearbox		GSAI		GSAO	
Continuous stall torque (Nm)		52.25	76.0	52.25	76.0
Peak torque (Nm)		80.0	80.0	156.75	225.0
Standard inertia (kg cm²)		1.61	2.34	1.61	2.34
Winding thermal time constant (sec)		93.0	98.0	93.0	98.0
Standard weight (kg)		7.78	8.88	12.08	13.18
Number of poles		10	10	10	10
Speed 300 (rpm)	Kt (Nm/A) =	1.6			
	Ke (V/krpm) =	98			
Rated torque (Nm)		46.08	50.0	46.08	65.55
Stall current (A)		4.85	6.9	4.85	6.9
Rated power (kW)		1.52	2.17	1.52	2.17
R (ph-ph) (Ohms)		5.05	2.68	5.05	2.68
L (ph-ph) (mH)		38.4	21.7	38.4	21.7
Recommended power conn' size		1	1	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
12kHz drive switching frequency
All other figures relate to a 20°C motor temperature.
Maximum intermittent winding temperature is 140°C

Geared motor dimension (mm) **GSAI** - VRL090B 10:1

	Feedback EC				Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox Diameter
	Unbraked length*		Braked length*								
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
089B	177.8	140.5	217.9	180.6	107.0	3.0	68.0	130.5	91.0	80.0	90.0
089C	207.8	170.5	247.9	210.6							

Geared motor shaft dimensions (mm)

Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 1)
22.0	36.0	24.5	28.0	6.0	M8	19.0

Geared motor dimension (mm) **GSAO** - VRL120B 10:1

	Feedback EC				Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox Diameter
	Unbraked length*		Braked length*								
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
089B	177.8	140.5	217.9	180.6	117.0	3.0	90.0	130.5	91.0	108.0	120.0
089C	207.8	170.5	247.9	210.6							

Geared motor shaft dimensions (mm)

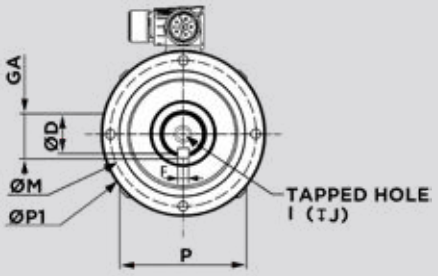
Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 1)
32.0	58.0	35.0	45.0	10.0	M12	28.0

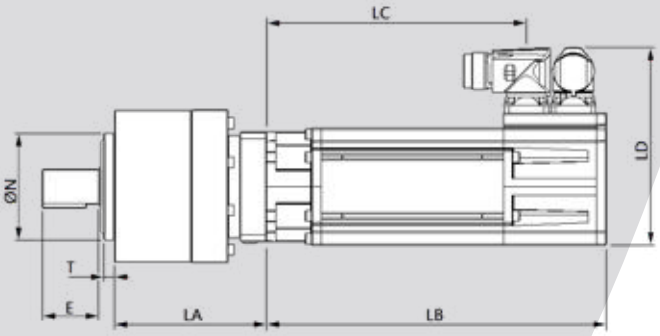
* Addtional feedback lengths

Feedback Code	Additional Length
EB, CA, RA	+13.0
AE	-10.0

Frame size 095 (fm)

Motor frame size (mm)		095U3					
Voltage (Vrms)		380-480					
Frame length		B	C	D	B	C	D
Gearbox		GSAI			GSAO		
Continuous stall torque (Nm)		42.75	59.85	75.05	42.75	59.85	75.05
Peak torque (Nm)		80.0	80.0	80.0	128.25	179.55	225.0
Standard inertia (kg cm²)		2.60	3.72	4.83	2.60	3.72	4.83
High inertia (kg cm²)		4.50	5.60	6.70	4.50	5.60	6.70
Winding thermal time constant (sec)		82.0	90.0	108.0	82.0	90.0	108.0
Standard weight (kg)		7.99	9.25	10.51	12.29	13.55	14.81
Number of poles		6	6	6	6	6	6
Speed 300 (rpm)	Kt (Nm/A) = Ke (V/krpm) =	1.6 98					
Rated torque (Nm)		38.95	50.0	50.0	38.95	53.20	65.55
Stall current (A)		2.80	3.90	4.90	2.80	3.90	4.90
Rated power (kW)		1.29	1.76	2.17	1.29	1.76	2.17
R (ph-ph) (Ohms)		8.63	4.67	3.16	8.63	4.67	3.16
L (ph-ph) (mH)		33.71	21.09	15.95	33.71	21.09	15.95
Recommended power conn' size		1	1	1	1	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 **12kHz drive switching frequency**
All other figures relate to a 20°C motor temperature.
Maximum intermittent winding temperature is 140°C

Geared motor dimension (mm) **GSAI** - VRL090B 10:1

	Feedback AE, CA, EC, FC, RA				Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox Diameter
	Unbraked length		Braked length								
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
095B	231.8	180.8	261.8	210.8	107.0	3.0	68.0	139.0	90.0	80.0	90.0
095C	261.8	210.8	291.8	240.8							
095D	291.8	240.8	321.8	270.8							

Geared motor shaft dimensions (mm)

Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 1)
22.0	36.0	24.5	28.0	6.0	M8	19.0

Geared motor dimension (mm) **GSAO** - VRL120B 10:1

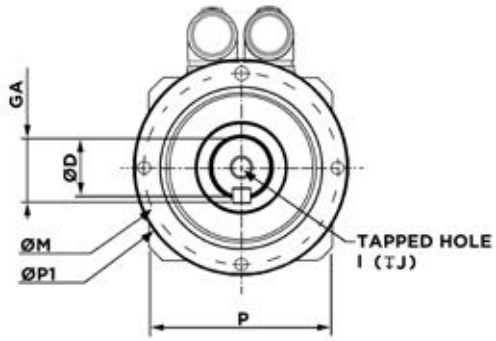
	Feedback AE, CA, EC, FC, RA				Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox Diameter
	Unbraked length		Braked length								
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
095B	231.8	180.8	261.8	210.8	117.0	3.0	90.0	139.0	90.0	108.0	120.0
095C	261.8	210.8	291.8	240.8							
095D	291.8	240.8	321.8	270.8							

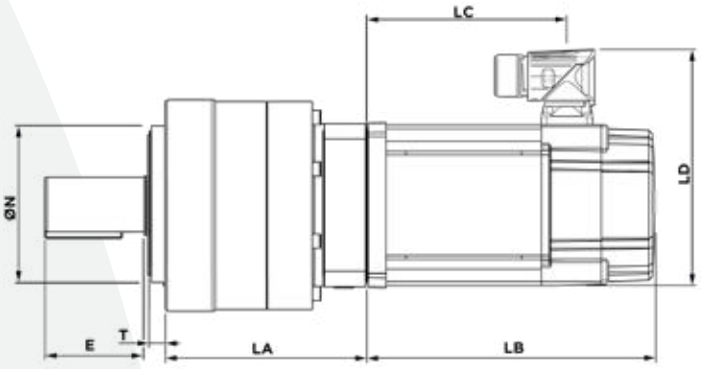
Geared motor shaft dimensions (mm)

Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 1)
32.0	58.0	35.0	45.0	10.0	M12	28.0

Frame size 115 (hd)

Motor frame size (mm)		115UD					
Voltage (Vrms)		380-480					
Frame length		B	C	D	B	C	D
Gearbox		GSAO			GSAU		
Continuous stall torque (Nm)		96.9	131.4	178.6	96.9	131.4	178.6
Peak torque (Nm)		225.0	225.0	225.0	290.7	416.1	470.0
Standard inertia (kg cm²)		4.41	6.39	8.38	4.41	6.39	8.38
Winding thermal time constant (sec)		164.0	168.0	175.0	164.0	168.0	175.0
Standard weight (kg)		14.75	16.52	18.29	22.95	24.72	26.49
Number of poles		10	10	10	10	10	10
Speed 300 (rpm)	Kt (Nm/A) = Ke (V/krpm) =	1.6 98					
Rated torque (Nm)		73.15	99.75	120.0	73.12	99.75	129.2
Stall current (A)		6.38	9.13	11.75	6.38	9.13	11.75
Rated power (kW)		2.42	3.30	4.27	2.42	3.30	4.27
R (ph-ph) (Ohms)		1.83	1.21	0.78	1.83	1.21	0.78
L (ph-ph) (mH)		16.9	12.7	8.70	16.9	12.7	8.70
Recommended power conn' size		1	1	1	1	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 **12kHz drive switching frequency**
All other figures relate to a 20°C motor temperature.
Maximum intermittent winding temperature is 140°C

Geared motor dimension (mm) **GSAO** - VRL120B 10:1

	Feedback EC				Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox Diameter
	Unbraked length*		Braked length*								
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
115B	193.8	154.0	230.9	191.1	134.0	3.0	90.0	156.5	116.0	108.0	120.0
115C	223.8	184.0	260.9	221.1							
115D	253.8	214.0	290.9	251.1							

Geared motor shaft dimensions (mm)

Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 0.1)
32.0	58.0	35.0	45.0	10.0	M12	28.0

Geared motor dimension (mm) **GSAU** - VRL155B 10:1

	Feedback EC				Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox Diameter
	Unbraked length*		Braked length*								
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
115B	193.8	154.0	230.9	191.1	152.0	3.0	120.0	156.5	116.0	140.0	155.0
115C	223.8	184.0	260.9	221.1							
115D	253.8	214.0	290.9	251.1							

Geared motor shaft dimensions (mm)

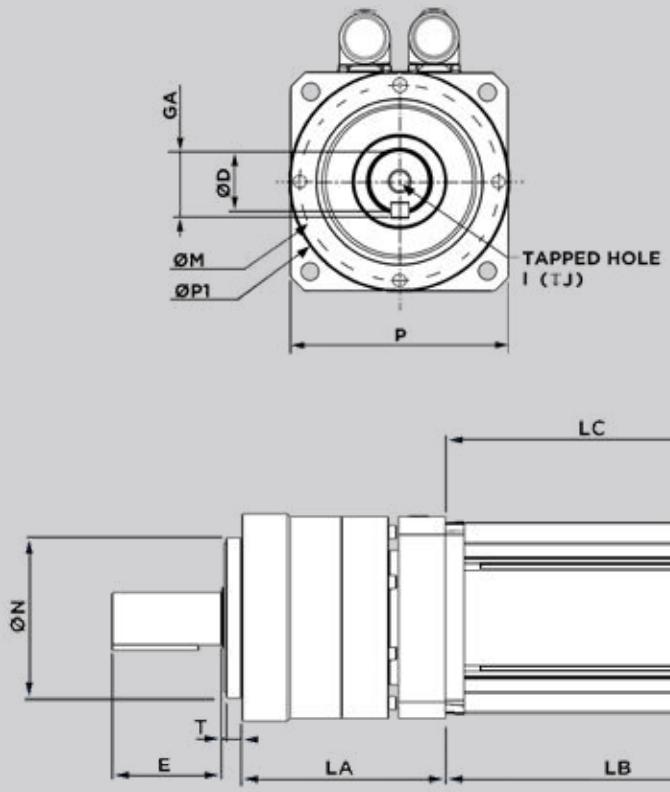
Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 0.1)
40.0	82.0	43.0	65.0	12.0	M16	36.0

* Addtional feedback lengths

Feedback Code	Additional Length
EB, CA, RA	+13.0
AE	-10.0

Frame size 142 (hd)

Motor frame size (mm)		142UD	
Voltage (Vrms)		380-480	
Frame length		C	
Gearbox		GSAU	GSBA
Continuous stall torque (Nm)		237.5	237.5
Peak torque (Nm)		470.0	711.55
Standard inertia (kg cm²)		17.0	17.0
Winding thermal time constant (sec)		245.0	245.0
Standard weight (kg)		28.74	51.74
Number of poles		10	10
Speed 300 (rpm)	Kt (Nm/A) = Ke (V/krpm) =	1.6 98	
Rated torque (Nm)		174.8	174.8
Stall current (A)		15.6	15.6
Rated power (kW)		5.78	5.78
R (ph-ph) (Ohms)		0.34	0.34
L (ph-ph) (mH)		5.30	5.30
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 **12kHz drive switching frequency**
All other figures relate to a 20°C motor temperature.
Maximum intermittent winding temperature is 140°C

Geared motor dimension (mm) **GSAU** - VRL155B 10:1

	Unbraked length		Braked length		Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox Diameter
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
142C	217.0	182.5	282.5	248.0	167.0	3.0	120.0	183.5	142.0	140.0	155.0

Geared motor shaft dimensions (mm)

Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 1)
40.0	82.0	43.0	65.0	12.0	M16	36.0

Geared motor dimension (mm) **GSBA** - VRL205B 10:1

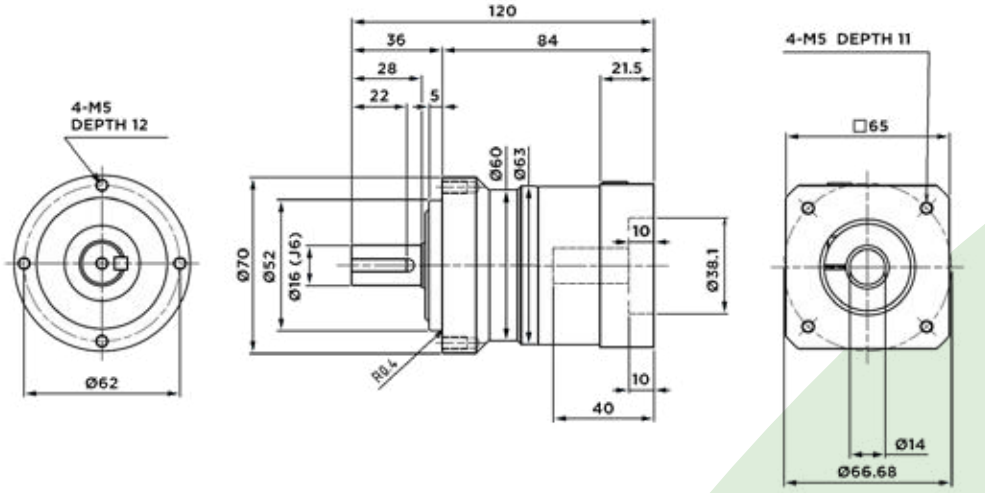
	Unbraked length		Braked length		Face to Face	Register length	Register diameter	Overall height	Flange square	Fixing hole PCD	Gearbox Diameter
	LB (± 0.9)	LC (± 1.0)	LB (± 0.9)	LC (± 1.0)	LA (± 0.5)	T (± 0.1)	N (j6)	LD (± 0.3)	P (± 0.3)	M (± 0.5)	P1 (± 0.5)
142C	217.0	182.5	282.5	248.0	186.5	3.0	160.0	183.5	142.0	184.0	205.0

Geared motor shaft dimensions (mm)

Shaft diameter	Shaft length	Key height	Key length	Key width	Tapped hole thread size	Tapped hole depth
D (j6)	E	GA	GF	F (h9)	I	J (± 1)
55.0	82.0	58.0	65.0	16.0	M20	42.0

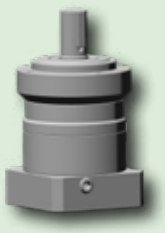
GSAC
VRL-070 (10:1)

Gearbox specifications

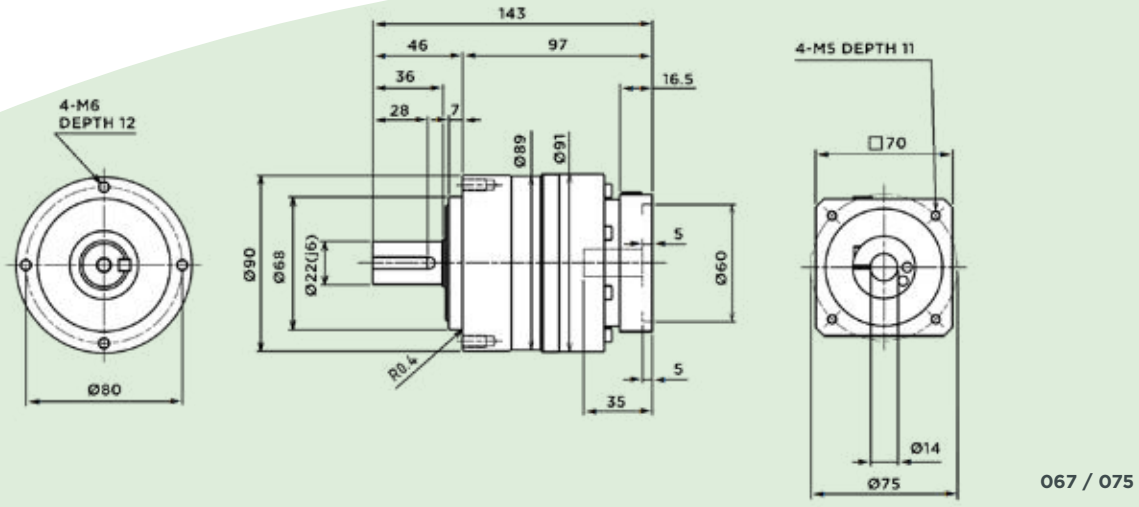


067 / 075

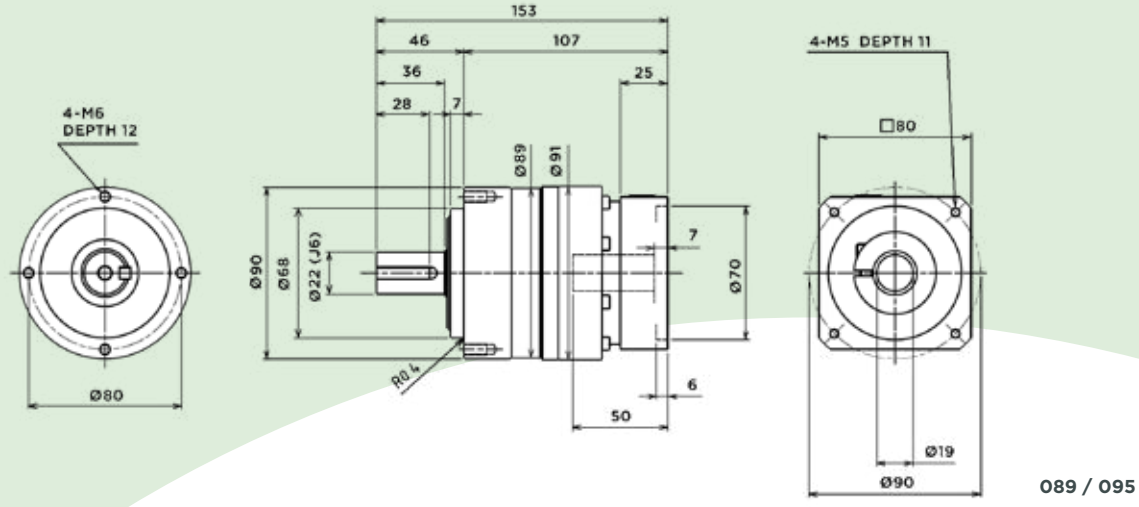
Gearbox Type	VRL-070B		
Stage	1		
Ratio	10:1		
Nominal Output Torque (Nm)	18	Moment of Inertia (≤ Ø 14) (kgcm²)	0.14
Maximum Acceleration Torque (Nm)	35	Moment of Inertia (≤ Ø 19) (kgcm²)	034
Emergency Stop Torque (Nm)	80	Efficiency (%)	95
Nominal Input Speed (rpm)	3000	Torsional Rigidity (Nm/arc-min)	3
Maximum Input Speed (rpm)	6000	Maximun Torsional Backlash (arc-min)	≤ 5
No Load Running Torque (Nm)	0.08	Noise Level (dB)	≤ 66
Permitted Radial Load (N)	640	Protection Class	IP54
Permitted Axial Load (N)	530	Ambient Temperature (°C)	0-40
Maximum Radial Load (N)	1200	Permitted Housing Temperature (°C)	90
Maximum Axial Load (N)	1100	Weight (kg)	1.5



GSAI
VRL-090 (10:1)



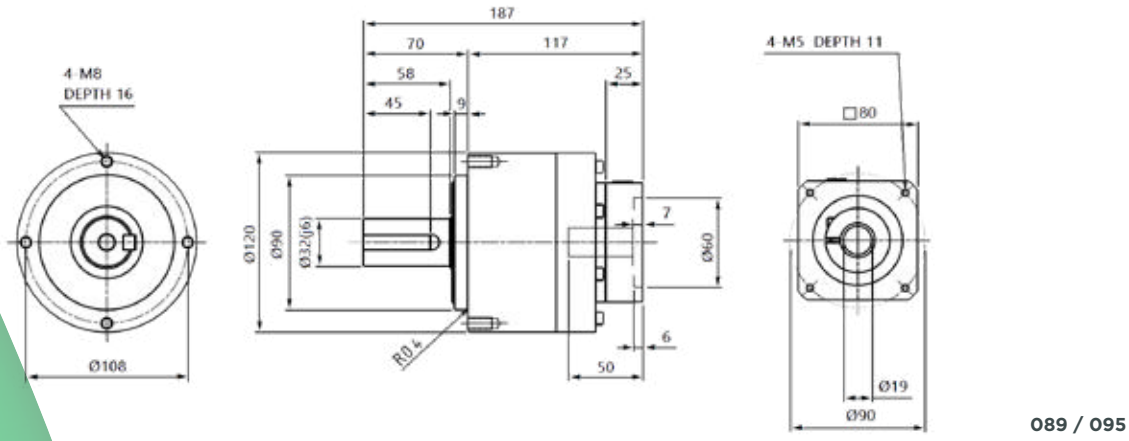
067 / 075



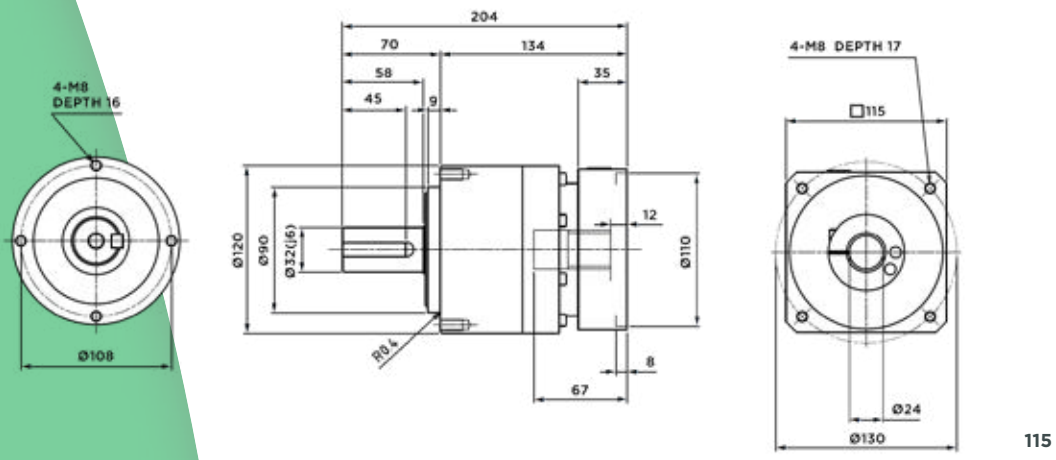
089 / 095

Gearbox Type	VRL-090B		
Stage	1		
Ratio	10:1		
Nominal Output Torque (Nm)	50	Moment of Inertia (≤ Ø 14) (kgcm²)	0.29
Maximum Acceleration Torque (Nm)	80	Moment of Inertia (≤ Ø 19) (kgcm²)	0.75
Emergency Stop Torque (Nm)	200	Efficiency (%)	95
Nominal Input Speed (rpm)	3000	Torsional Rigidity (Nm/arc-min)	10
Maximum Input Speed (rpm)	6000	Maximun Torsional Backlash (arc-min)	≤ 5
No Load Running Torque (Nm)	0.35	Noise Level (dB)	67
Permitted Radial Load (N)	1200	Protection Class	IP54
Permitted Axial Load (N)	1600	Ambient Temperature (°C)	0-40
Maximum Radial Load (N)	2400	Permitted Housing Temperature (°C)	90
Maximum Axial Load (N)	2200	Weight (kg)	3.5

GSAO
VRL-120 (10:1)



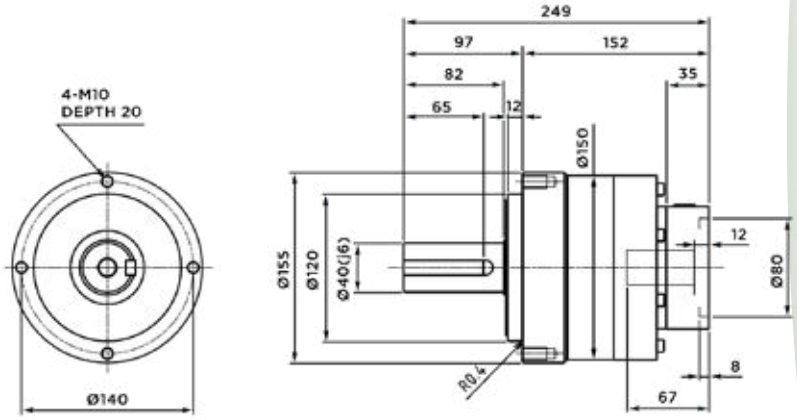
089 / 095

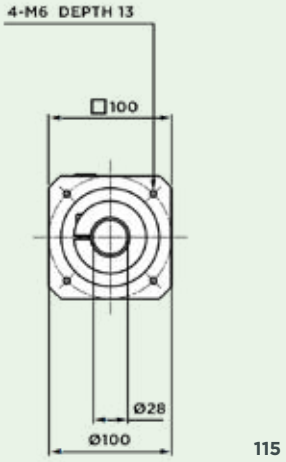


115

Gearbox Type	VRL-120B		
Stage	1		
Ratio	10:1		
Nominal Output Torque (Nm)	120	Moment of Inertia (≤ Ø 19) (kgcm²)	0.95
Maximum Acceleration Torque (Nm)	225	Moment of Inertia (≤ Ø28) (kgcm²)	3.00
Emergency Stop Torque (Nm)	500	Efficiency (%)	95
Nominal Input Speed (rpm)	3000	Torsional Rigidity (Nm/arc-min)	31
Maximum Input Speed (rpm)	6000	Maximun Torsional Backlash (arc-min)	≤ 5
No Load Running Torque (Nm)	1.30	Noise Level (dB)	71
Permitted Radial Load (N)	2000	Protection Class	IP54
Permitted Axial Load (N)	2500	Ambient Temperature (°C)	0-40
Maximum Radial Load (N)	4300	Permitted Housing Temperature (°C)	90
Maximum Axial Load (N)	3900	Weight (kg)	7.8

GSAU
VRL-155 (10:1)





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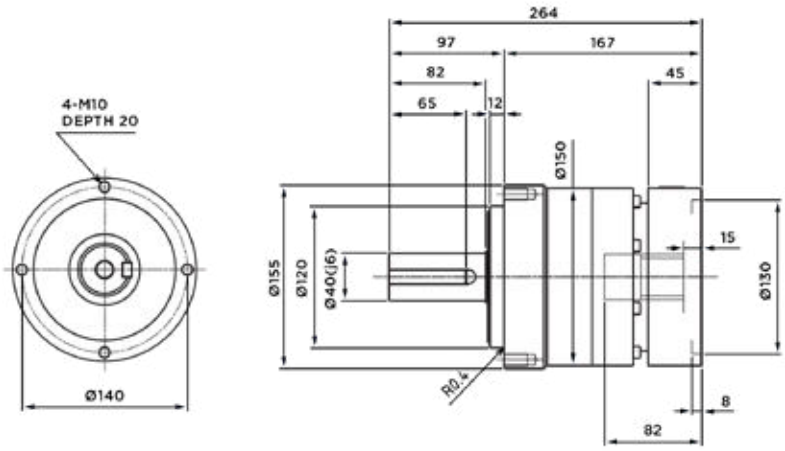
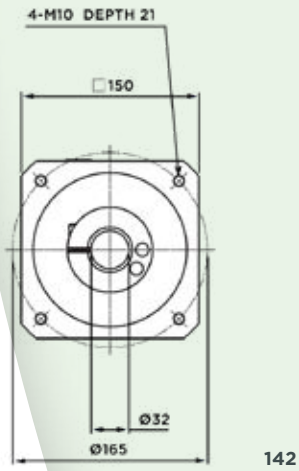


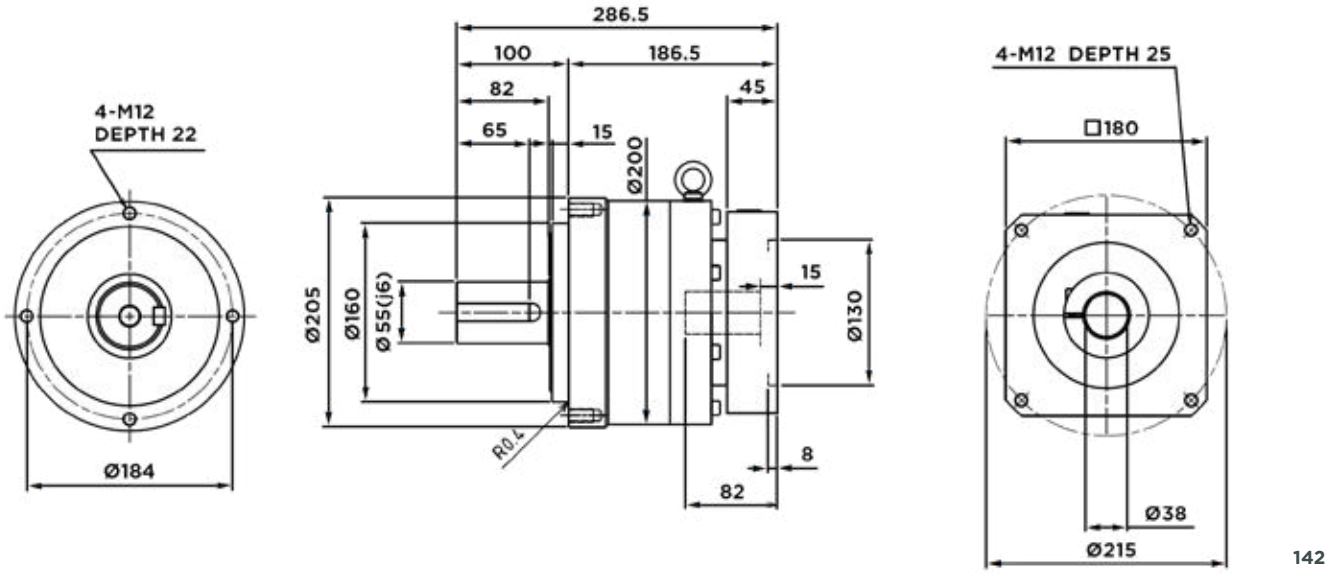


142

Gearbox Type	VRL-155B		
Stage	1		
Ratio	10:1		
Nominal Output Torque (Nm)	240	Moment of Inertia (≤ Ø 28) (kgcm²)	3.50
Maximum Acceleration Torque (Nm)	470	Moment of Inertia (≤ Ø 38) (kgcm²)	11.00
Emergency Stop Torque (Nm)	1000	Efficiency (%)	95
Nominal Input Speed (rpm)	2000	Torsional Rigidity (Nm/arc-min)	60
Maximum Input Speed (rpm)	4000	Maximun Torsional Backlash (arc-min)	≤ 5
No Load Running Torque (Nm)	1.63	Noise Level (dB)	67
Permitted Radial Load (N)	4700	Protection Class	IP54
Permitted Axial Load (N)	4100	Ambient Temperature (°C)	0-40
Maximum Radial Load (N)	9100	Permitted Housing Temperature (°C)	90
Maximum Axial Load (N)	8200	Weight (kg)	16.0

GSBA

VRL-205 (10:1)



142

Gearbox Type	VRL-205B
Stage	1
Ratio	10:1
Nominal Output Torque (Nm)	500
Maximum Acceleration Torque (Nm)	970
Emergency Stop Torque (Nm)	2200
Nominal Input Speed (rpm)	1500
Maximum Input Speed (rpm)	3000
No Load Running Torque (Nm)	2.68
Permitted Radial Load (N)	8400
Permitted Axial Load (N)	7300
Maximum Radial Load (N)	15000
Maximum Axial Load (N)	14000
Moment of Inertia (≤ Ø 38) ($kgcm^2$)	14.00
Moment of Inertia (≤ Ø 48) ($kgcm^2$)	36.00
Efficiency (%)	95
Torsional Rigidity (Nm/arc-min)	175
Maximun Torsional Backlash (arc-min)	≤5
Noise Level (dB)	67
Protection Class	IP54
Ambient Temperature (°C)	0-40
Permitted Housing Temperature (°C)	90
Weight (kg)	39.0

Additional geared motor weights

Additional motor weight information (kg)												
Motor Frame Size	067	075		089		095			115			142
Motor type	hd	fm		hd		fm			hd			hd
Frame Length	B	B	D	B	C	B	C	D	B	C	D	C
Braked '5' Brake	♦	♦		♦		♦			♦			+2.8
Braked '6' Brake	+0.68	+0.7		+1.4		+1.4			+2.09			♦
High Inertia	♦	+0.17		♦		+0.51			♦			♦
Fan Box	♦	+1.2		♦		+1.35			+1.65			+1.9

♦ not applicable.
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 available
067 motors									
AR	Resolver	LTN RE – 15	7 Vdc Excitation 5kHz	1 Transformation ratio 0.5	Medium 16384 (14 bits)	-	Low +/- 600"	-	hd only
CR	Incremental Encoder	R35i	5 Vdc ± 10%	4096	Medium 16384 (14 bits)	-	Medium +/- 150"	-	hd only
EM (Multi-turn)	Inductive EnDat SinCos	EQI 1130	5 Vdc ± 5%	16	High 2.62 x 10^5 (18 bits)	4096 (12 bits)	Low +/- 480"	EnDat 2.1 / EnDat 01	hd only
075 – 142 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				-			fm only
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	-
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	hd only

[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.

Brake specification

Geared Unimotors 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.

Motor frame	Supply volts	Input power @ 20 °C	Static torque	Release time	Moment of inertia	Backlash **
			Parking Brake (6)			
Size	Vdc	Watts	Nm	ms nom	kg.cm²*	Degrees **
067	24	15	2	35.2	0.063	0.75
075	24	tba	2	64	consult factory	1.03
089	24	18.5	10	72.8	0.259	0.75
095	24	18	10	64	0.153	1.25
115	24	17.5	16	64	0.506	0.75
			Parking Brake (5)			
142	24	17.5	16	64	0.506	0.77

*Note 1 kg.cm^2 = 1 x 10 – 4 kg.m^2 ** 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 themotor runs through high acceleration and deceleration.

Performance definitions

Stall torque

This is the maximum torque within the continuous zone at zero speed. Maximum continuous torque ratings may be intermittently exceeded for short periods provided that the winding Δt max temperature is not exceeded.

Δt max = 100 °C over a maximum ambient of 40 °C for Unimotor fm and Unimotor hd.

Stall current

Stall current = Stall torque / kt

Motor label and performance tables quote stall current when motor is at full power in a maximum ambient of 40 °C.

Rated speed

This is the maximum speed of the motor within the continuous zone. The motor speed can be controlled to any speed subject to the voltage limits and drive constraints as shown by the intermittent zone on a motor performance graph

Ke voltage constant

This is the phase to phase rms voltage generated at the stator when the shaft is back driven at 1,000 rpm with the rotor at 20 °C.

Kt torque constant

A brushless motor delivers torque proportional to the current, such that torque = Kt x current.

Where Kt = 0.0165 x Ke (at 20 °C).

Magnets used on all motors are affected by temperature such that Ke and Kt reduce with increasing temperatures of the magnets. The reductions depends upon the magnet type and material grade used.

Winding thermal time constant

The thermal time constant of the winding with respect to the stator temperature as a reference in the exponential temperature rise given by the formula:

Winding temperature at time t seconds = T0+T1(1-e-t/tc)

Where T0 is the initial temperature,T1 is the final winding temperature and tc = thermal time constant (seconds)

Note that temperature = 63.2 % of T1 when t=tc

A thermal protection trip is provided by the drive, based upon calculations using elapsed time, current measurement, and the parameter settings set by the user or directly from the motor map.

Unimotor hd windings are ultimately protected by thermistor devices in the winding overhangs. These must be connected to the appropriate drive inputs via the motor feedback signal connector.

Rated power

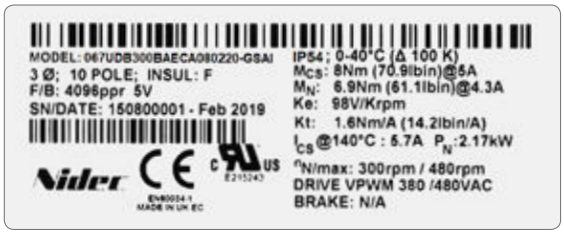
This is the product of the rated speed (radian/sec) and the rated torque (Nm) expressed in Watts (W).

Δt temperature

Δt temperature is the temperature difference between the copper wires of the motor winding and the ambient air temperature surrounding the motor.

The maximum Δt temperature permitted is 100 °C over a maximum ambient of 40 °C.
(i.e. a maximum winding temperature of 140 °C)

Nameplate definitions



Model Full part number of the motor

3Ø Indicates this is a 3 phase motor

POLE Number of poles: 055 – 8 poles – 4 pole pairs 067-190 – 10 poles – 5 pole pairs

Insul Windings are built to class F (155 °C)

F/B This gives the feedback device, count and working voltage or the feedback type

S/N/DATE The serial number and date the motor was manufactured

IP Ingress protection rating IP 65S

Mcs The stall torque at stall current

Mn The rated torque of the motor

Ke This is the AC Volts per 1,000 rpm with the motor at 20 °C

Kt Value shown is for the magnet's temperature at 20 °C

Ics The constant stall current at the maximum winding temperature of 140 °C

Pn The rated power of the motor

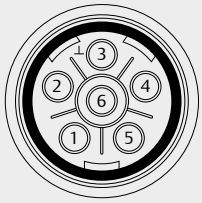
nN/max The rated speed/ this is the maximum speed allowed when taking into account these three factors:
1) Maxdrive voltage
2) Maxencoder speed
3) Maxmechanical speed

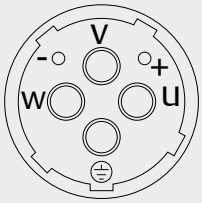
VPWM This indicates that the motor is for use with a voltage pulse width modulated drive with the supply voltage shown

Brake The current, that rated torque and the operation voltage for the brake or N/A if the brake is not fitted

Connector wiring diagrams

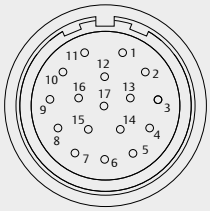
POWER PLUG - Motor end

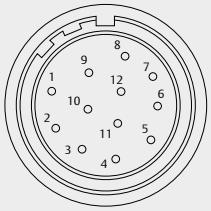




Size 1			Size 1.5		
	With brake	Without brake		With brake	Without brake
Pin	Function	Function	Pin	Function	Function
1	Phase U (R)	Phase U (R)	U	Phase U (R)	Phase U (R)
2	Phase V (S)	Phase V (S)	V	Phase V (S)	Phase V (S)
3	Ground	Ground	⏚	Ground	Ground
4	Phase W (T)	Phase W (T)	W	Phase W (T)	Phase W (T)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

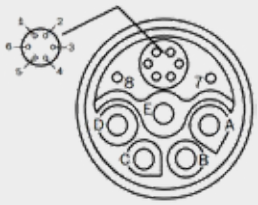
SIGNAL PLUG - Motor end

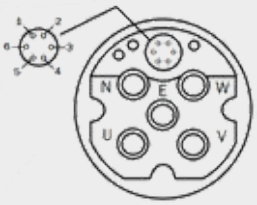




	SI		SE	SR	SS
	Incremental encoder (CA, CR)	Heidenhain Sincos EnDat 2.1 absolute encoders (EM, FM, EC, FC, EB, FB)	Heidenhain EnDat 2.2 only absolute encoders (EF, FF, EG, FG, GB, HB, EN, FN)	Resolver (AE, AR)	SICK SinCos Hiperface encoders (RA, TL, UL, SA)
Pin	Function	Function	Function	Function	Function
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

POWER & SIGNAL COMBINED PLUG - Motor end





Size 1			Size 1.5		
Heidenhain EnDat 2.2 only absolute encoders (EF, FF, EG, FG, GB, HB, EN, FN)			Heidenhain EnDat 2.2 only absolute encoders (EF, FF, GB, HB)		
	With brake	Without brake		With brake	Without brake
Pin	Function	Function	Pin	Function	Function
1	+ Volts	+ Volts	1	+ Volts	+ Volts
2	0 Volts	0 Volts	2	0 Volts	0 Volts
3	+ Data	+ Data	3	+ Data	+ Data
4	- Data	- Data	4	- Data	- Data
5	+ Clock	+ Clock	5	+ Clock	+ Clock
6	- Clock	- Clock	6	- Clock	- Clock
7	- Brake		N	-	-
8	+ Brake		U	Phase U (R)	Phase U (R)
A	Phase U (R)	Phase U	V	Phase V (S)	Phase V (S)
B	Phase V (S)	Phase U (R)	PE	Ground	Ground
C	Phase W (T)	Phase W (T)	W	Phase W (T)	Phase W (T)
D	-	-	+	Brake	
E	Ground	Ground	-	Brake	

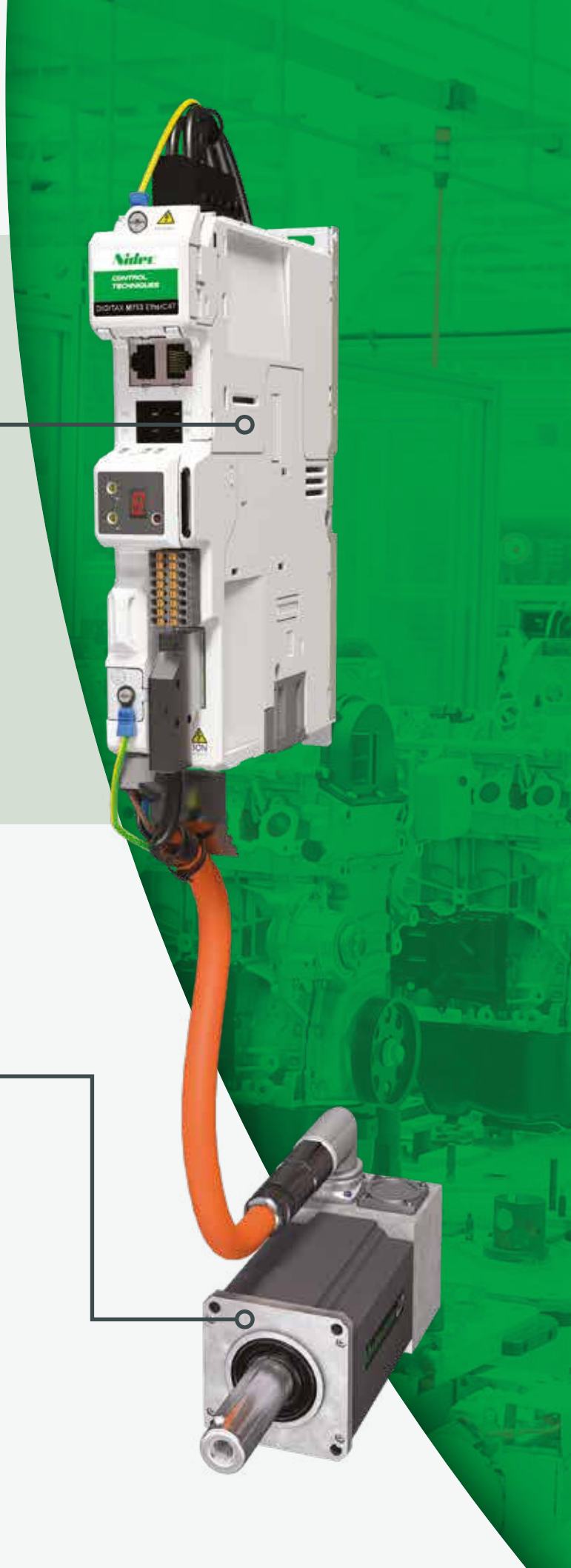
15 WAY PLUG - Drive end

	SI		SE	SR	SS
	Incremental encoders (CA, CR)	SinCos absolute encoders (EM, FM, EC, FC, EB, FB)	EnDat 2.2 only absolute encoders (EF, FF, EG, FG, GB, HB, EN, FN)	Resolvers (AE, AR)	SinCos Hiperface encoders (TL, UL, RA, SA)
Pin	Function	Function	Function	Function	Function
1	Channel A	+ Cos	+ Data	+ Cos	+ Cos
2	Channel A Inverse	- Cos	- Data	- Cos	REF Cos
3	Channel B	+ SIn	+ Clock	+ Sin	+ Sin
4	Channel B Inverse	-Sin	- Clock	- Sin	REF Sin
5	Index	+ Data		+ Excitation	+ Data
6	Index Inverse	- Data		- Excitation	- Data
7	S1				
8	S1 Inverse				
9	S2				
10	S2 Inverse				
11	S3	+ Clock			
12	S3 Inverse	- Clock			
13	+ V	+ V	+ V		+ V
14	0 Volts	0 Volts	0 Volts	Thermistor	0 Volts
15	Thermistor	Thermistor	Thermistor	Thermistor	Thermistor
Body	Screen	Screen	Screen	Screen	Screen

Perfect partnership

Digitax HD

Digitax HD adds to the Unidrive M range with maximum servo performance in a minimum size package. Optimized for high-dynamic applications, Digitax HD provides the flexibility of both standalone and modular configurations. The drive offers full servo control plus open loop permanent magnet and induction motor control across four functionality levels: EtherCAT, MCi machine control, multiprotocol Ethernet and the flexible Base drive.



Unimotor hd

Unimotor hd is Control Techniques' high dynamic brushless AC servo motor range. With high peak torque, low inertia and the most compact dimensions, Unimotor hd is optimized for applications requiring rapid acceleration and deceleration.

Minimum size servo solutions

Actual size

Just 40 mm

Reduce cost and maximize floor space

Minimal footprint and exceptional power density make Digitax HD one of the smallest servo drives on the market today. This means that you can build the most compact cabinets possible.

The market's narrowest servo drive

Digitax HD is just 40mm wide

25 drives, up to 16A per channel, can fit in just 1 meter of cabinet space

Drive dimensions at a glance

Dimensions	Frame 1	Frame 2	Frame 3
Width (mm)	40 mm	40 mm	40 mm
Depth (mm)	174 mm	174 mm	174 mm
Height (mm)	233 mm	278 mm	328 mm
Nominal current @ 400 V	4.2 A	10.5 A	16 A
Peak current @ 400 V	12.6 A	31.5 A	48 A

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