

Norwin Product Overview

Automation Range

Brushless AC Servo Drives & Motors

DC Servo Drives & Motors

Intelligent Operator Panels

Motion Controllers

Optical Encoders

Planetary Gearboxes

Worm Gearboxes

Transformers & Chokes

Custom Designs

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BRUSHLESS AC SERVO DRIVES WITH BUILT IN MOTION CONTROLLER AND PLC

MD230 SERIES

	MD230/1	MD230/2	MD230/5	MD230/7
V supply (Vrms)	230 / 1ph			
Nominal current	1.25 A	2.5 A	5 A	7.5 A
Peak current	2.5 A	5 A	10 A	15 A
Nominal power	0.35 kVA	0.7 kVA	1.5kVA	2.3 kVA
WxHxD (mm)	67x215x203			

MD400 SERIES

	MD400/1	MD400/2	MD400/5
V supply (Vrms)	400 / 3ph		
Nominal current	1.25 A	2.5 A	5 A
Peak current	2.5 A	5 A	10 A
Nominal power	0.7 kVA	1.4 kVA	3 kVA
WxHxD (mm)	67x215x203		

IMD SERIES

	IMD/1	IMD/2	IMD/5	IMD/10	IMD/20
V supply (Vrms)	230 to 480 / 3ph				
Nominal current	1.25 A	2.5 A	5 A	10 A	20 A
Peak current	2.5 A	5 A	10 A	20 A	40 A
Nominal power	0.7 kVA	1.4 kVA	2.8 kVA	5.6 kVA	11.2 kVA
WxHxD (mm)	72x293x233				125x293x233

IMDL SERIES

	IMDL230/2	IMDL230/5	IMDL400/1	IMDL400/4
V supply (Vrms)	230 / 1ph		400 / 3ph	
Nominal current	2.5 A	5 A	1.25A	4 A
Peak current	5.0 A	10 A	2.5 A	8 A
Nominal power	0.7 kVA	1.5 kVA	0.7 kVA	2.2 kVA
WxHxD (mm)	64x293x201			

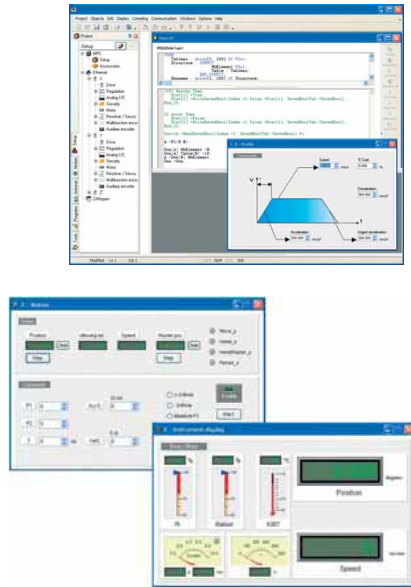
The MD, IMD and IMDL series of Intelligent Drives offer high dynamic performance control for Brushless AC Servo Motors.

- Mains operation: Single and 3-Phase up to 20A.
- Space saving integrated power supply, mains filter and braking resistor.
- Wide ranging application programming via the built in PLC: counters, timers, cam boxes and I/O.
- Motion Features: Torque, Speed, Position & Stepper modes with Gearbox, Cam, Position capture, Synchronisation & Registration functions.
- Flexible Interfacing: Standard I/O & various Bus Communications options.
- Easy Configuration using supplied Set up & software tools: Instrument and Diagnostics display, Function Generator, Oscilloscope, Hyper-terminal, Cam Editor.



FEATURES	MD series	IMD / IMDL series
Architecture	Processor:40 MHz DSP Multi-tasking real-time core. Memory: 512 Kbits Flash for program & parameters 1000 lines for programs	Processor: 150 MHz DSP plus 100 000 gate FPGA Multi-tasking real-time core. Task priority level. Memory: 2 Mbits Flash for program & parameters 64 Kbits FRAM for saved data. 2000 lines for programs
Regulation loops	Current loop: 160 µs Speed loop: 320 µs Position loop: 640 µs	Current loop: 75 µs Speed loop: 150 µs Position loop: 150 µs
Motor feedback	Resolver	Resolver or SinCos encoder HIPERFACE
Position Loop feedback	Resolver	Resolver, Incremental or Absolute SSI encoder, Analogue input or SinCos encoder HIPERFACE
Encoder emulation	Incremental: A, /A, B, /B, Z, /Z 1024 ppr	Incremental: A, /A, B, /B, Z, /Z 1 to 100 000 ppr
Master encoder	Incremental encoder	Incremental or Absolute SSI encoder, Analogue input or SinCos encoder HIPERFACE
Digital I/O	4 inputs, 2 outputs as standard Option module: 12 inputs, 8 outputs (100mA)	4 inputs, 2 outputs as standard Option module: 12 inputs, 8 outputs (500mA)
Analogue I/O	2 inputs -10 bits, 1 output -8 bits	1 input -16 bits, 1 input -12 bits, 1 output -8 bits
Communication	CANopen (limited), RS 232 MODBUS RTU RS 422, RS 485 MODBUS RTU	CANopen DS 402 profile, RS 232 MODBUS RTU RS 422, RS 485 MODBUS RTU.
Brake resistor	Integrated: 30W. Provision for an external resistor	Integrated: 60W. Provision for an external resistor
MOTION FUNCTIONS		
Positioning	Absolute, relative & infinite movements	Absolute, relative & infinite movements
Double loop regulation	NO	YES
S profiles	NO	YES
CAM profiles	NO	YES
Gearbox	YES	YES
Synchronisation movement	NO	YES
Registration capture	YES (640 µs)	YES (1 µs)
Triggered movement	NO	On master position, position capture and digital input
CAMBOX functions	YES	YES
Stepper emulation	NO	YES

MPC – Motion PLC Controller



The MPC combines the functions of a Motion Controller, PLC and an Industrial PC in one compact module. Designed for use with the IMD range of brushless ac drives, its high speed 100 Mbits/s Industrial Ethernet Field Bus allows for fast and accurate positioning. Its advanced motion control functions make it ideally suited to a broad range of industrial applications.

- Open and evolutionary architecture
- Digital data buses for simplified wiring, e.g.:- CANopen for remote I/O
Ethernet TCP/IP for HMI, Servers and PC
Industrial Ethernet for real time and deterministic transfer of cyclic and acyclic data for servo drives.
- IEC61131-3 programming
Six languages for Standardized programming:
Ladder Logic
Structured Text
Instruction List
Function Block Diagram
Sequential Function Chart
Continuous Function Chart
- MOTION STUDIO
Intuitive, user friendly software enables rapid application development and management of complex machines with a high update rate.

SPECIFICATION

Power supply	24V DC \pm 20%, 1.5A typical with Galvanic isolation
Architecture	Intel Celeron® processor, 400MHz Real time multi-tasking core Compact Flash memory 64 MB RAM saved data memory 128KB RAM 64 MB
Local inputs /outputs	MPCIO module (option) - 32 inputs / 24 outputs - 24 V DC PNP inputs - 24 V DC PNP static outputs, 500 mA per output
Communication	1 x Ethernet TCP/IP 100 Mbit/s 1 x Industrial Ethernet 100 Mbit/s 2 x USB 1 x CANopen 1Mbit/s 1 x RS232, 1 x RS232 / RS485
Watch Dog	Relay: N/O contact
Diagnostic	STATUS display
Advanced Motion Functions	Fast and accurate positioning Electronic gearbox with adjustable ratio CAM Profiles with dynamic phase adjustment Compensation and superposition movement functions Linear and helical interpolation Registration with 10 μ s capture window CAM boxes
Dimensions (w x h x d) mm	66 x 283 x 198
Operating temperature	5 to 45 °C

Motion Studio Features

- Editors with syntax description
- Creation of function blocks
- Choice program type & priority
- Cross references
- CAM profile definition by graphic tool
- Easy Declaration of axes, I/O & variables
- Alarm display
- Tree structure configuration
- Tool boxes
- Multi-window
- Graphic editors

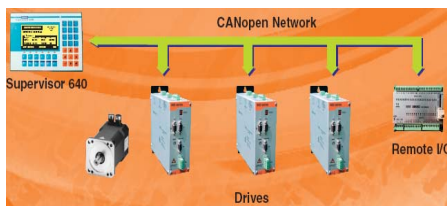
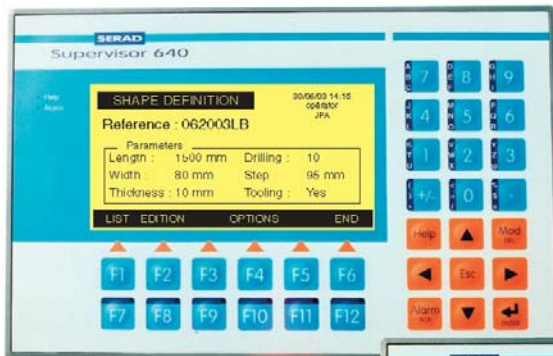
Motion Studio Set-up Tools

- Instrument display
- Trace mode & single step
- Breakpoints
- Axis auto-tuning
- Trajectory generators
- Motion simulator
- Hyper terminal
- Variable watch list
- Animation tables
- Digital oscilloscope
- Network analyser

Typical Applications

- Label printing
- Packaging machines
- Textile machines
- Press feeding
- Water jet cutters
- Pick & place robots
- Woodworking machines
- Flow regulation
- Dosing

OPERATOR TERMINALS THE INTELLIGENT SUPERVISOR



The SUPERVISOR 80 and 640 are: Intelligent operator terminals capable of managing automated machines.

They provide an open system that is adaptable for all applications that comprise an HMI, PLC and serial communications.

Using their communication ports they can communicate by serial link or fieldbus with various elements of an automated system such as intelligent drives, distributed I/O, PLC, PC, etc.

Windows based application SPL offers easy programming in Basic or Ladder.

Optional plug in internal I/O cards provide:
12 inputs and 8 outputs (20 channels)
RS232, RS422 and RS485
CANopen communications

- 33MHz, 32 bit Processor.
- Real-time, multi-tasking kernel: 28 tasks, 3 priority levels, 16 interrupts, 1 event driven task
- Non volatile RAM - 4Mbits
- Flash Memory - 8Mbits
- Watchdog security
- Backlit screen (auto-off setting S640 only)
- 8 character sets (S640 only)
- Tactile keyboard
- Range of software tools

SPECIFICATION

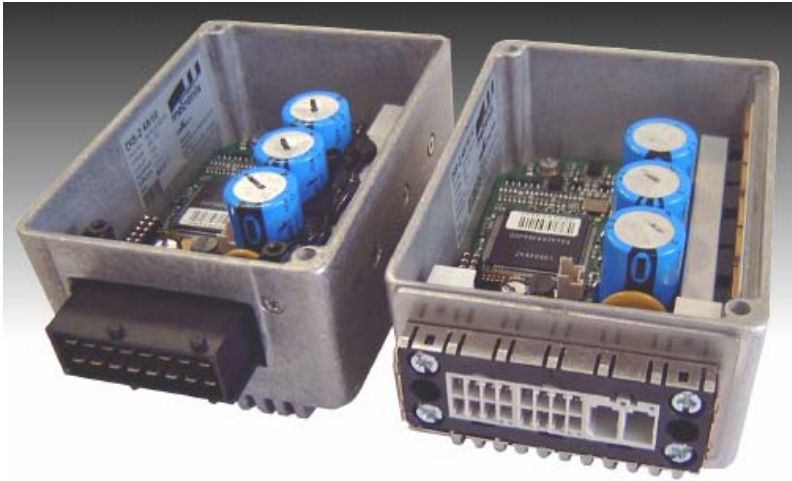
	SUPERVISOR 80	SUPERVISOR 640
Supply voltage	24Vdc	24Vdc
Power Requirements	8W	12W
Operating temperature	0 to 45 °C	0 to 45 °C
Storage temperature	-20 to 70 °C	-20 to 70 °C
Front panel protection	IP65	IP65
WxHxD (mm)	178x138x53	245x168x53

DISPLAY	SUPERVISOR 80	SUPERVISOR 640
Monochrome LCD display	LED backlight	CFL backlight
Display area	74 x 23 mm	122 x 66 mm resolution 240 x 128 pixels
Character sizes	1	8
Lines x characters	4 x 20	16 x40, 9 x30, 8 x 26, 6 x 17
Character attributes	Normal - blinking	Normal - reverse - blinking
KEYBOARD		
Keys with tactile feedback	28	33
Dynamic function keys	6	12
Re-legendable function keys	6	6
Numeric and alphanumeric keypad	Yes	Yes
Status LEDs	8	8
Buzzer	Yes	Yes
PERFORMANCE		
Real time core, multitasking	32 bit processor 28 tasks, 3 priority levels	32 bit processor 28 tasks, 3 priority levels
Non-volatile RAM memory	8 Mbits	8 Mbits
Real time clock	Yes	Yes
Communication (optional)	COM1: RS 232 COM2: RS 232, RS 422, RS 485, CANopen	COM1: RS 232 COM2: RS 232, RS 422, RS 485 COM3: CANopen
Digital Inputs / Outputs (optional)	12 inputs / 8 outputs	12 inputs / 8 outputs
Watchdog	Yes	Yes
SOFTWARE		
Programming Language	Basic	Basic
Set-up tools	Hyper-terminal, CANopen analyser Single step mode-breakpoints Oscilloscope	Hyper-terminal, CANopen analyser Single step mode-breakpoints Oscilloscope
Integrated help	Yes	Yes

COMPACT INTELLIGENT AC SERVO DRIVE

48 VDC, 10A

DIS-2 48/10



The DIS-2 48/10 is a fully digital AC servo drive for Brushless AC Motors and Permanent Magnet DC motors operating from a supply voltage of 24 to 48 VDC.

Compact and robust it can be mounted directly onto a motor or machine.

- Can be used as a torque, speed or position controller with synchronization
- EMC compliant
- Integrated CANopen with DSP402
- Easy connection to PLC using I/O or fieldbus
- Optional user-interface plug arrangement
- Programming and diagnostics via RS232 or CANopen interface.
- Windows based software for easy set-up and diagnostics – "DIS- ServoCommander™"
- Enclosure protection to IP67 (depending on mounting arrangement)
- Internal slot for plug-in option modules (e.g. Profibus interface)

SPECIFICATION

	DIS-2 48/10
Supply voltage	24 to 48 VDC \pm 20%
Control voltage	24 VDC \pm 20%
Rated current	10 A _{RMS} 15 A _{RMS} (Power stage temperature < 50°C)
Maximum current (for 2 sec)	32 A _{RMS} 40 A _{RMS} (Power stage temperature < 50°C)
Rated Power	500 VA (at 48 VDC)
Maximum power (for 2 sec)	1500 VA (at 48 VDC)
PWM frequency	10 kHz
Housing temperature	0 to 65°C
Maximum ambient temperature	50°C
Enclosure	IP54 (up to IP67 depending on the mounting arrangement)
W x H x D (mm)	80 x 110 x 56
Position feedback	Resolver Analogue Hall sensor Digital six-step Hall sensor with block commutation SinCos encoder with HIPERFACE
Interfaces	RS232, CANopen, additional expansion slot (e.g. for PROFIBUS)
Inputs	8 x DIN, 24V 2 x AIN, \pm 10V differential, 12 Bit
Outputs	3 x DOUT, 24V 1 x Brake, 24V 1 x AOUT, 0 to 10V, 8 Bit Additional incremental encoder output for synchronization
MOTION FUNCTIONS	
Positioning	64 positioning sets (4 groups of 16 positions) Stored as absolute or relative point to point positions Interpolated position mode available via integrated CAN bus
Set-point assignment	2 analogue \pm 10V inputs or via the fieldbus

OPTIONS

DIS-2 ServoCommander™ (set-up software)
Connector Set for DIS-2 48/10
PROFIBUS Interface Module

BRUSHED DC SERVO DRIVES WITH INTEGRAL POWER SUPPLY

NE1700 SERIES



The NE1700 Series is a range of PWM servo controllers complete with integral power supply. Primarily intended for use with Permanent Magnet Brushed DC Servo Motors, they provide low cost, versatile functionality in a variety of applications.

- Integrated power supply allows for operation from either an AC or DC supply (except 1710, see below).
- 4-Quadrant operation.
- LED status indication.
- Current fold-back function limits the average current available to the motor preventing motor damage during stalled conditions.
- External current limit input allows control of the peak current while operating in speed control mode (not 1710).
- Link selectable Velocity or Torque modes.
- Link selectable Tach or Armature Voltage Feedback.
- Positive & negative over-travel limit inputs (not 1710)
- Personality module fitted on 1750 & 1770 models.
- Integral bus shunt regulator provides for dissipation of regenerated energy (not 1710).
- Short-circuit protection.

SPECIFICATION

	NE1710	NE1720	NE1740L	NE1740	NE1750	NE1770
Rated Power	100 W	700 W	800 W	1400 W	1960 W	6300 W
AC Supply Volts (Min/Max)	18-0-18V (1-ph only)	42 / 105V	24 / 57V	60 / 105V	60 / 105V	50 / 145V
DC Bus Volts (Min/Max)	22 / 30V	60 / 148V	32 / 80V	85 / 148V	85 / 148V	70 / 205V
Armature Output Current - Peak	10 A	10 A	20 A	20 A	28 A	70 A
Armature Output Current - Cont.	5 A	5 A	10 A	10 A	14 A	35 A
Switching Frequency	18 kHz	18 kHz	18 kHz	18 kHz	18 kHz	17 kHz
Minimum Armature Inductance	0.4 mH	1.5 mH	1.0 mH	1.5 mH	1.5 mH	0.7 mH
Operating temperature	0-50 °C	0-50 °C	0-50 °C	0-50 °C	0-50 °C	0-50 °C
Protection Class	IP00	IP00	IP00	IP00	IP20	IP20
WxHxD (mm)	45x145x220	50x240x220	55x240x220	55x240x220	85x280x220	165x325x220

INPUT POWER

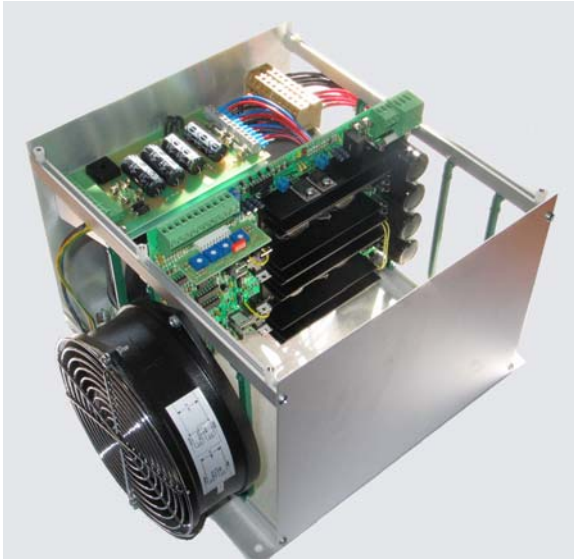
In most applications the supply for the above modules will be obtained from the secondary of either a single-phase or three-phase isolating transformer. The kVA rating of the isolating transformer will depend on:

- The number of drives connected to the transformer
- The nominal torque and speed of each associated motor

A range of Transformers up to 3kVA is available from stock.

BRUSHED DC SERVO DRIVES RACK MOUNTED ONE TO FOUR AXIS SYSTEMS

NE2100 SERIES



The NE2100 Series is a range of rack-mounted PWM servo controllers designed for use in high dynamic performance, low cost servo systems with Permanent Magnet Brushed DC Servo Motors.

- 4-Quadrant operation.
- LED status indication.
- Extensive protection features.
- Plug-in Personality Modules for set up and adjustment of major parameters:
 - Selection of Torque / Speed Mode
 - Command gain
 - Tach Gain
 - Continuous Current
 - Velocity stability
- Optional bus shunt regulator module provides for additional dissipation of regeneration energy.
- Positive & negative over-travel limits.
- Panel mounted fan cooled racks supply all the required bus and logic power when used with a suitable isolating transformer.

SPECIFICATION

	NE2100	NE2140
DC Bus Volts (Max)	100 V	180 V
Peak Armature Output Current	30 A	40 A
Continuous Armature Output Current	15 A	20 A
Switching Frequency	10 kHz	13 kHz
Minimum Armature Inductance	1.5 mH	1.0 mH
Operating temperature	0-50 °C	0-50 °C
Protection Class	IP00	IP00
WxHxD (mm)	40x145x220	45x240x220

Protection Features:

- Fused Bus supply
- Fused logic supplies
- Armature short circuit trip
- Armature over current trip
- i^2t fold back or trip (selectable)
- Heat sink over-temperature trip
- Bus supply over/under voltage detect
- Logic supplies under voltage detect

RACKS WITH POWER SUPPLIES

	NE3106	NE3107	NE3108	NE3109
Axes	4	2	4	2
Continuous current	60A	60A	35A	35A
Bus Voltage (max.)	180V	180V	180V	180V
WxHxD (mm)	280x325x190	185x325x190	280x325x190	185x325x190

HIGH PERFORMANCE SERVO MOTORS AC BRUSHLESS AND DC BRUSHED

AC BRUSHLESS SERVO MOTORS

HDM SERIES



**HIGH TORQUE DENSITY - LOW INERTIA
EXTREMELY COMPACT DESIGN**
Combining Neodymium Iron Boron magnets with segmented sector technology, the HDM offers high torque to size ratio.
Ideal where space is a premium and high dynamic performance is required, up to 25 Nm.

HR SERIES



HIGH ACCELERATION / DECELERATION
Combining Neodymium Iron Boron magnets with LOW inertia rotors, the HR series offers high dynamic performance in frame sizes from 55 to 190mm.
Ideal for applications as a standard stock motor where high response is required, up to 67 Nm.

HRS SERIES



HIGH ACCELERATION / DECELERATION
The same rare earth magnets and electrical characteristic as the HR series, with LOW inertia rotors offer dynamic performance from frame sizes 92 to 142mm.
Ideal for most applications, particularly where a smooth bodied shorter motor than the HR is required. Available up to 25 Nm

HJ SERIES



**LARGE DIAMETER SHAFT, ROTOR &
BEARINGS – HIGH ROTOR INERTIA &
SHAFT STIFFNESS**
For applications requiring increased stability at low speeds together with increased rigidity.
Ideal for machine tool and direct drive applications up to 67Nm

DC BRUSHED SERVO MOTORS

MT SERIES



**WELL PROVEN RANGE WITH MULTIPLE
OPTIONS**
4 frame sizes with non-vented and vented versions.
Ideal for Low cost, conventional applications, in particular for direct replacement maintenance up to 35 Nm.

The SEM ranges of AC Brushless and DC Brushed Servo Motors have been specially designed to meet the application requirements of Machine Tools, Transfer Lines, Robotics and the like.

In the AC Brushless Motors, Neodymium-Iron-Boron (NdFeB) Magnets, together with carefully engineered design of windings and construction, have been used to produce a range of motors with a mix of characteristics giving the option of:
Either: High torque to inertia ratios for rapid acceleration and high dynamic response
Or: High inertia and rotor stiffness for smooth running at low speeds.

Brushless motor features include:

- Sinusoidal motor back E.M.F. and current waveforms.
- Integral Resolver fitted as standard. Other feedback devices are available as options.
- Thermal sensor mounted in the motor winding.
- Class F insulation
- Continuous stall torque from 0.2 to 67 Nm
- Speeds up to 10,000 RPM.
- IP 65 enclosure protection. IP 64 at shaft with seal fitted.
- Bearings are double shielded, single row radial ball type, which under normal conditions are maintenance free.
- A range of design options, offer:
Holding Brakes (spring applied or permanent magnet).
Incremental or absolute Encoders (single / multi-turn)
Keyed or non-keyed shafts
Plug, flying lead or terminal connections
- Variants and special designs are also available on request.

In the Brushed motor range, ferrite permanent magnets and skewed motor armature design ensure exceptionally smooth running at all speeds.

- Integral tachogenerator
- Thermal cut-outs (not MT22 range)
- Encoder interface facility
- Open circuit stabilized permanent magnetic field
- Wide range of options

RANGE DATA

	HDM	HR	HRS	HJ	MT
Stall torque, cont. (Nm)	0.48 to 25	0.20 to 25	1.5 to 25	2.8 to 67	0.5 to 37
Stall current, cont. (A rms)	0.93 to 16	0.39 to 24	2.0 to 37	1.8 to 32	2.8 to 75
Max peak current (A)	4.20 to 94	2.30 to 140	11.0 to 78	8.4 to 190	11 to 650
Max Speed (RPM)	10,000	8,000	6,000	6,000	5,000
Flange sizes (mm)	58,82,105,42	55,70,92,115,142	92,115,142,190	96,116,130,155,190	=====
Shaft Diameters (mm)	9,14,19,24	9,11,14,19,24,32	14,19,24	19,22,24,32,38	12,16,24,32
Protection rating (IP)	65	65	65	65	44/65

ASYNCHRONOUS AC MOTORS

STANDARD AND INVERTER DRIVEN RANGES

STANDARD PRODUCTION

- SERIES T** Three phase.
- SERIES D** Double polarity three phase.
- SERIES S** Single phase.
- SERIES TB** Three phase with brake.
- SERIES DB** Double polarity three phase with brake.
- SERIES SB** Single phase with brake.
- SERIES HS** High starting torque single phase with switched capacitor.

B3



B14



B5



SPECIFICATIONS

The table shows the smallest and largest values of power, current and torque for each range of motors in each series for frames 63 – 132.

For frames 160 – 400 (power 11kW – 560kW) and NEMA 143T to 5010. Contact our Engineering Department.
Tel:01767 651485 Email: info@norwin.co.uk

For direct mains or inverter drive operation, these three phase and single phase motors can be fitted with a host of options with modifications to suit most applications.

They are easily assembled to an extensive range of worm, helical and helical bevel gears.

UK stocked standard motors, Custom motors and prototypes are available on request.

- Totally enclosed, with fan cooled ventilation
- Powers 0.09 to 11 kW, frames 63 to 132
- Powers 11 to 560 kW, frames 160 to 400
- Supply up to 600V – dual 50/60 Hz available
- 2, 4, 6, 8 pole and dual speed operation
- Frames B3, B5 and B14 versions & NEMA
- Lifting rings from size 112
- Cast-iron and aluminium alloy finned case
- Insulation class F (class H on request)
- Protection ratings IP 55, 56, 65, 66 and 68
- Radial ball & roller bearings lubricated for life
- UL / CSA versions, metric and imperial

Frame sizes 63 to 132	Series T and TB (230/400V/50/60Hz)				Series D and DB (400V/50/60Hz)			Series S and SB (230V/50/60Hz)			Series HS (230V/50/60Hz)		
	2	4	6	8	2/4	4/8	2/8	2	4	6	2	4	6
Power - max (kW)	11	9.2	5.5	3	11/8.5	6/3.7	7.5/2	3	2.2	1.5	3	2.2	1.5
Power - min (kW)	0.18	0.12	0.09	0.07	0.18/0.12	0.18/0.11	0.18/0.05	0.18	0.12	0.09	0.18	0.12	0.09
I nom - max (A)	23.6	19.5	11.5	8.7	24/17	12.6/12.5	11.5/5.7	18	13.2	12	18	13.2	12
I nom - min (A)	0.63	0.58	0.52	0.5	0.55/0.55	0.53/0.72	0.58/0.42	1.4	1.3	1.1	1.4	1.3	1.1
M nom - max (Nm)	35.9	61	54.1	39.5	35.7/55.8	39.7/48.8	10/20	10.2	15	16.3	10.2	15	16.3
M nom - min (Nm)	0.62	0.84	0.97	1.08	0.62/0.83	1.27/1.55	0.61/0.61	0.6	0.81	0.93	0.6	0.81	0.93
M s / M nom (ratio)	4.1	3	2.2	2.5	2.2/2.2	1.7/2.2	2.8/2.3	0.4	0.5	0.55	1.8	2.4	2.0

OPTIONS

- **Inverter duty**
 - Low speed cooling electric fan kit for rear in-case mounting.
 - Speed / position feedback, incremental encoder for rear shaft mounting.
 - Winding phase separators for long cable runs and multi-motor connections.
- **Motor Brakes – 4 types**
 - MS ac electromagnetic brake for heavy duty cycles e.g. Lifting, Handling and Packaging.
 - FM dc electromagnetic brake for smooth operation Geared motors, transfer operations, and inverter operation with separate power supply to brake.
 - ML and PC are lightweight dc electro-magnetic parking brakes for special applications.
- **Connections and Windings**
Standard options are available for use in both the UK and US.
 - Fast disconnect multi-pin plugs.
 - 50 / 60Hz dual frequency operation.
 - Dual fixed speed – Series D. Single winding with switchover. YY/Δ or YY/Y for fans and centrifugal pumps requiring less torque at low speeds.
- **Backstop Device**
 - Prevents reverse rotation due to load dragging action.

FEATURES – For arduous operating conditions

- **Heavy Duty Cycle:** Thermal overload protection can be provided by a bi-metallic thermo-protector, PTC or PT100.
- **High Humidity:** TROP1 up to 90%. TROP2 can be provided on request. Condensation drainage holes and anti-condensation heaters are available options.
- **Low temperature operation:** –15°C to –50°C, with special lubricated bearings, oil seals, fans, terminal boxes, plugs and glands.
- **High altitude and temperature:** 1000 to 4000 m above sea level or between 40°C and 60°C use power de-rating chart for standard motors. Above 60°C consult our Engineering Department.

ADDITIONS

- Geared Motors up to 45kW
- Single and 3 phase drives up to 315 kW



CONFORMITY

- **All metric motor specifications are covered by:**
IEC34 and 7 electrical and mechanical standards and comply with the Low Voltage Directive 73/23/EC (amended by Directive 93/68/EC)
- **Motors considered as components comply with:**
EMC Directive 89/336/EC (amended by 92/31/EC and 93/68/EC) & Machinery Directive 98/37/EC when installed in accordance with the manufacturer's instructions.

