■ Selection of PM Motors

These motors offer high precision at a low price and are used in a wide array of office automation equipment as well as various other applications. Our PM motor offering spans a large range of motor sizes or output torques. We pride ourselves on our design and manufacturing systems that ensure the rapid delivery of motors perfectly suited to their applications. On this page we list several parameters that can be used in the selection of a PM motor.

Depending on the application, the conditions of use, and the model in which the motor will be used, it is necessary to set motor characteristics for optimum conditions. We therefore recommend, in addition to making a selection based on information on this website, that you order a variety of samples and conduct an evaluation of the products when in use in the actual equipment. Please contact your local sales representative or e-mail us for sample order.

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These pages do not constitute any part of the product specifications and are intended only as reference material in aiding with the selection of a motor. Also, please note that the contents of these page are liable to change without notice. Even if there are any changes to the information given here, this will have no influence whatsoever on products for which specifications have already been agreed and which are in production. If there should be any impact on products already manufactured, we will submit a request for approval of changes to the customer, and make any such changes only after receiving the customer's agreement.

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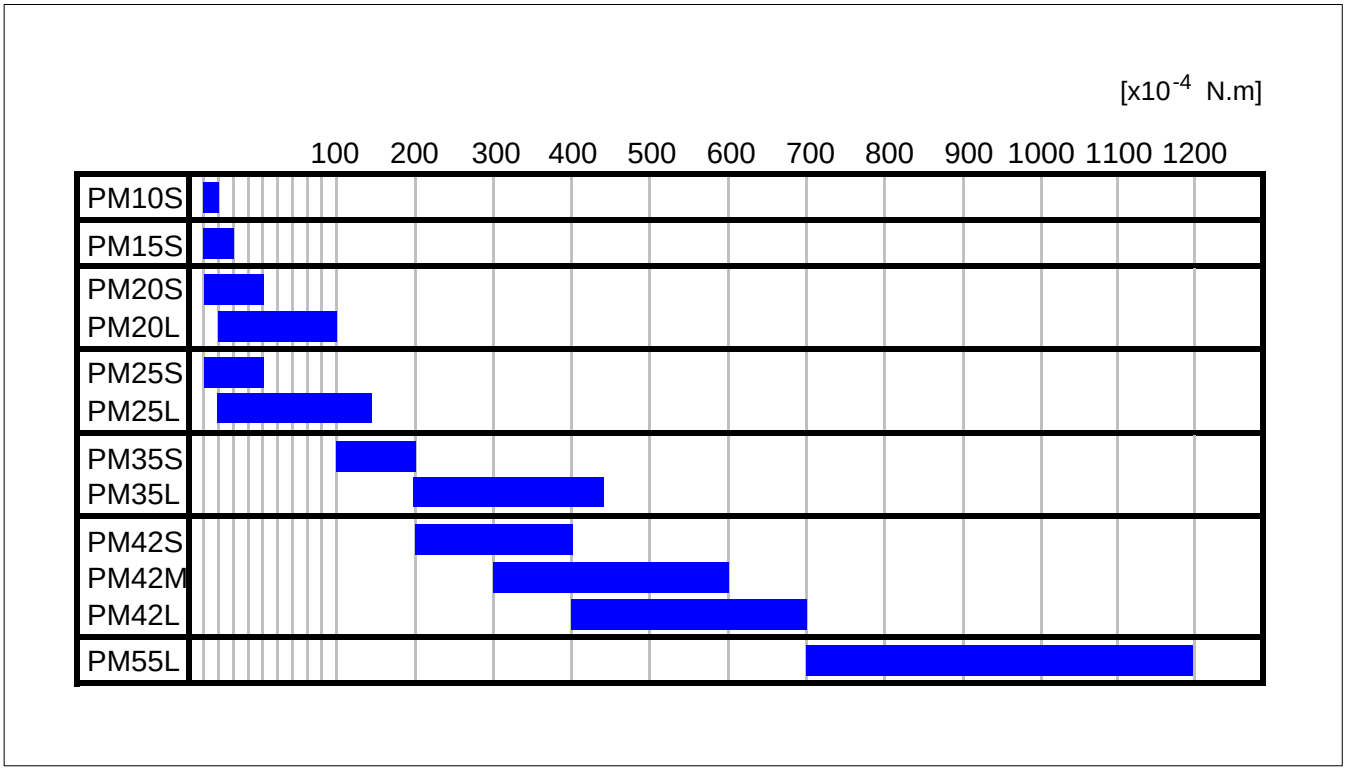
Selection in view of Torque Requirements (1)

The torque generated by a motor is determined by the size of the motor. Also, the heat resistance temperature of the magnet wires used in the motor limits the maximum torque for each motor size. UL and other safety standards impose further limitations. These specify that the motor surface should normally be at 105°C. In addition, when UEW (polyurethane wire: class E) is used the magnet wire heat resistance temperature is a maximum 120°C. We cannot guarantee reliability if the coil is used at temperatures exceeding this.

Torque Range According to Motor Size



The above graph shows output torque range by motor size. Within this range, coil resistance and magnet materials can be tailored for optimum motor settings. For Nd-Fe-B bonded magnets only, it is possible to control magnetization, and it is therefore possible to make adjustments to rotor flux.

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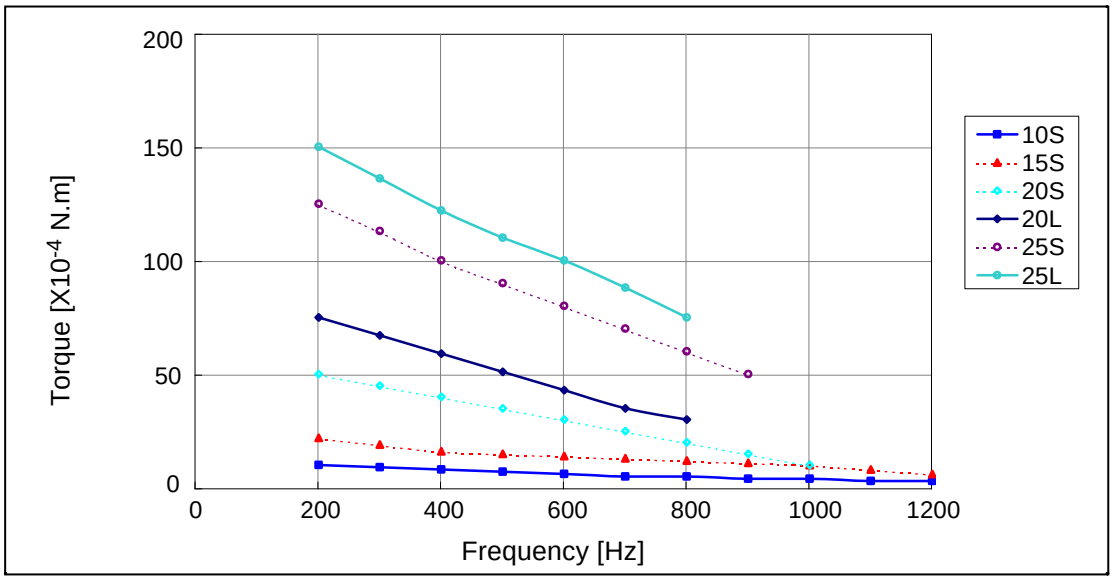
■ Selection in view of Torque Requirements (2)

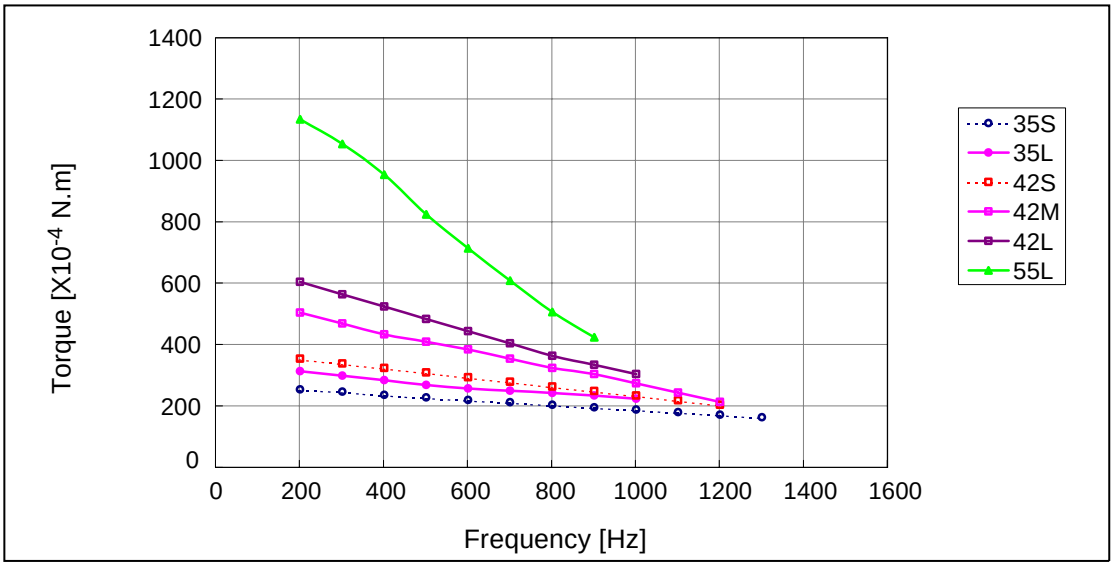
The output torque of a motor varies according to the drive speed. Even if the motor is driven at the same voltage, the rise in revolution speed leads to increased occurrence of electrical motive force, and to higher coil impedance. This in turn makes it harder for current to flow through the coil, thus lowering torque. The following graphs list the average torque for each size of motor. Please refer to this information in making your selection.

PM10S~ PM25L



Magnets for sizes PM15 to PM25 mainly display MS70 characteristics.

PM35~ PM55



Magnets for sizes PM35 to PM42 mainly display MS50 characteristics,
While magnets for size PM55 display MSPL characteristics.

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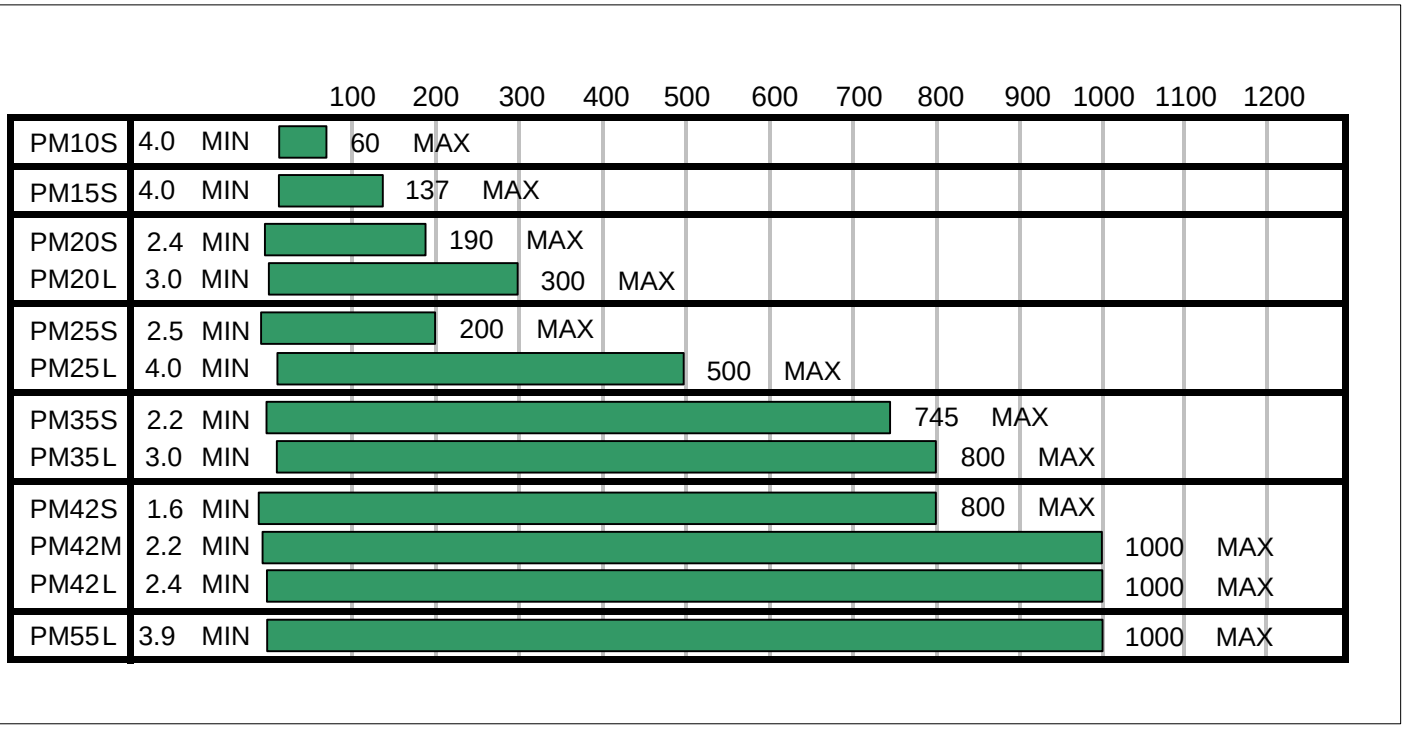
Setting of Resistance Value

Resistance value is restricted by service voltage and rise in motor temperature. Further, there are limitations on potential settings due to considerations of power conservation and restrictions on power supplies and motor drivers receiving power. Please pay due attention to these limitations when deciding settings. In addition, coil winding volume is restricted by motor size, so please refer to the following resistance value ranges when establishing settings. If priority is placed on torque, after taking temperature rise into account we can establish settings here by ourselves. In this case, please inform us of the drive conditions, the level of duty, the method of attachment, temperature conditions during use, and any or all other necessary specifications.

Resistance Value Range According to Motor Size



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Condition of Temperature

The major factor limiting output torque is the temperature of the motor coil. It is therefore necessary to gain an understanding of the temperature characteristics of the motor under conditions of normal usage. Also, the surface area varies according to motor size, and radiation characteristics therefore also naturally vary, leading to changes in motor temperature. The following shows the major characteristics of our motors. Please pay particular attention to this information when selecting a motor.

Coil temperature rise per 1W input

PM15S	PM20S	PM20L	PM25S	PM25L	PM35S	PM35L	PM42S	PM42M	PM42L	PM55L
54	35	31	30	26	19	16	15	14	13	8

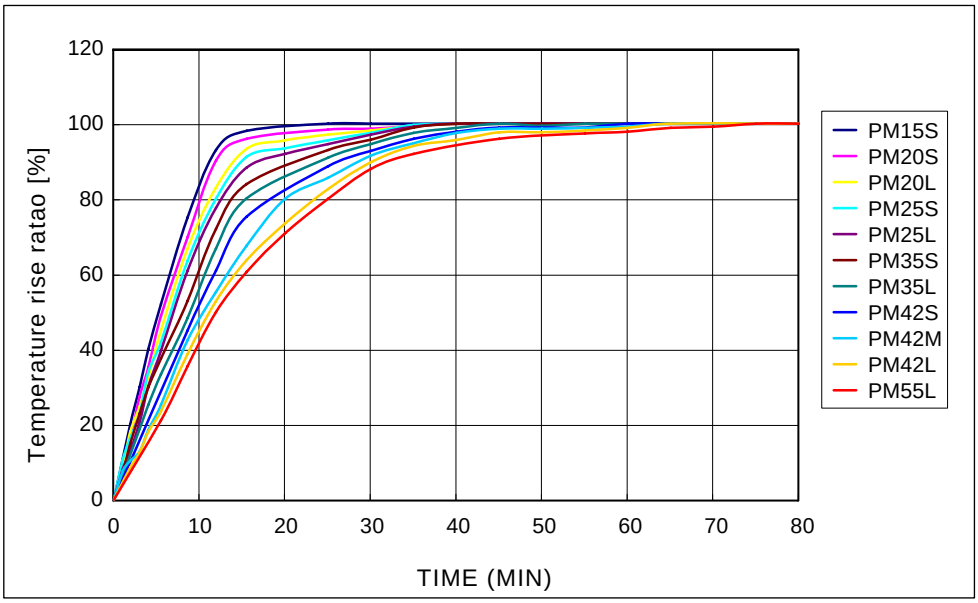
* If input power (W) is multiplied by the relevant value above, you can gain a rough estimate of the coil temperature.

Ratio between motor surface temperature and coil temperature

PM15S	PM20S	PM20L	PM25S	PM25L	PM35S	PM35L	PM42S	PM42M	PM42L	PM55L
0.9	0.91	0.91	0.91	0.91	0.88	0.87	0.87	0.88	0.88	0.87

* If you measure the motor surface temperature and divide that figure by the relevant value above, you can gain a rough estimate of the coil temperature.

Time to reach coil temperature saturation



The graph shows the amount of time until the coil reaches saturation temperature.
This information allows you to judge when overdrive is possible for a short time, such as when the motor is operating under light duty conditions of use.

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Selection of Magnet (1)

We provide three different materials for magnets, the choice depending on the necessary torque and rotor inertia requirements, etc. Please note that the price of magnets varies depending on the material. In principle, we make the selection of material ourselves, doing our very best to keep prices low while ensuring the necessary torque. Of course, you, as our customer, can also specify the magnet material that you require. We have two methods of assembling the rotor - adhesive type, or plastic molding - and the selection of method is based on a consideration of the difference in cost and manufacturing technology. Depending on the assembly method used, there are variations in cost and rotor inertia.

Combination of Motor Size and Magnet Material

MSPL ----- Ferrite plastic magnet
MS50 ----- Polar anisotropy ferrite sintered magnet
MS70 ----- Nd-Fe-B bonded magnet

	MSPL	MS50	MS70
PM10S			
PM15S			
PM20S			
PM20L			
PM25S			
PM25L			
PM35S			
PM35L			
PM42S			
PM42M			
PM42L			
PM55L			

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Selection of Magnet (2)

The differences in torque arising from the choice of magnet material are roughly as shown below.
The figures are shown as an index conversion value where MS50 is 100.

MSPL	75
MS50	100
MS70	115

MSPL

MS50 ADHESIVE

MS50 MOLD

MS70 ADHESIVE

MS70 MOLD

Standard Inertia for Each Motor Size

[g·cm^2]

	MSPL	MS50		MS70	
		MOLD	ADHESIVE	MOLD	ADHESIVE
PM10S					0.02
PM15S					0.04
PM20S					0.30
PM20L					0.43
PM25S			0.72		0.67
PM25L			1.17		0.88
PM35S	2.86		4.84	2.85	3.51
PM35L	5.15	7.75	7.81	4.47	5.79
PM42S	8.1	11.37	13.91	7.36	10.26
PM42M	8.01	14.36		7.03	
PM42L	12.91	22.09	22.82	11.08	18.53
PM55L	41.3	80.02	92.14	33.2	60.13

* For MS50 and MS70, the mold type is the standard specification. An adhesion type is applied only at the demand on characteristic (a big inertia is needed) etc., while it becomes factor a cost-up.

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