

Synchronous reluctance motor-drive  
package for machine builders  
High performance for ultimate machine  
design

# Combine the benefits of premium motor control and synchronous reluctance technology

Our drive with direct torque control easily integrates with your machine to give you the design flexibility and control you need. Synchronous reluctance motors provide the advantages of permanent magnet motors together with the cost-efficiency, simplicity and service-friendliness of an induction motor.

## Choose the right package

- IE4 SynRM package for highest efficiency performance
- High output SynRM package for compact machine design

## SynRM advantages

- No magnets
- Cool running rotor
- Improved bearing system reliability
- Easy service

## SynRM for a wide range of applications

- Designed to replace induction and permanent magnet motors in variable speed applications
- Typical applications include pumps, fans, compressors, extruders, conveyors, mixers and decanters among others







### Excellent control performance

- Sensorless synchronous motor control provides precise speed control
- Accurate torque control over the whole speed range



### ACS850 drive features

- Safe torque off (STO) as standard
- Removable memory unit
- Runs any motor type including synchronous reluctance motors

### Winner of the 2011 Automation Award – The Automation Oscars

The SynRM motor-drive package won Germany's most important automation award at the SPS/IPC/DRIVES trade show in Nuremberg.





## Synchronous reluctance (SynRM) motor-drive packages give more options to improve your machine designs

Finding ways to improve machine designs helps you produce more competitive machines. We offer two package options to help you to improve your competitiveness.

### IE4 SynRM motor-drive package

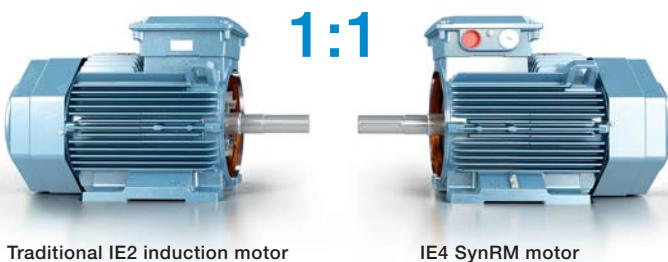
This package is focused on efficiency and meets the IE4 super premium efficiency grading as well as increase machine reliability.

### High output motor-drive package

This package will reduce your machine weights and motor size, or optionally, you can increase the power 20 to ~100 percent using the same motor frame size.

Package highlights	
<b>Super efficiency</b>	Meets the IE4 super premium efficiency and offers excellent partial load efficiency performance
<b>Reliability</b>	IE4 SynRM motors run uniquely cool keeping the motor bearing temperature very low which increases bearing system reliability
<b>Easy retrofit</b>	Can replace standard induction motors – same power and size combinations

Package highlights	
<b>Small size</b>	Same output with a motor that's up to two frame sizes smaller – enables smaller, lighter and more cost-efficient machine designs.
<b>High output</b>	Up to double output power at higher speed without increasing motor size
<b>Good efficiency</b>	Good efficiency from IE2 to IE3



Traditional IE2 induction motor

IE4 SynRM motor

**Super premium efficiency from same frame size**

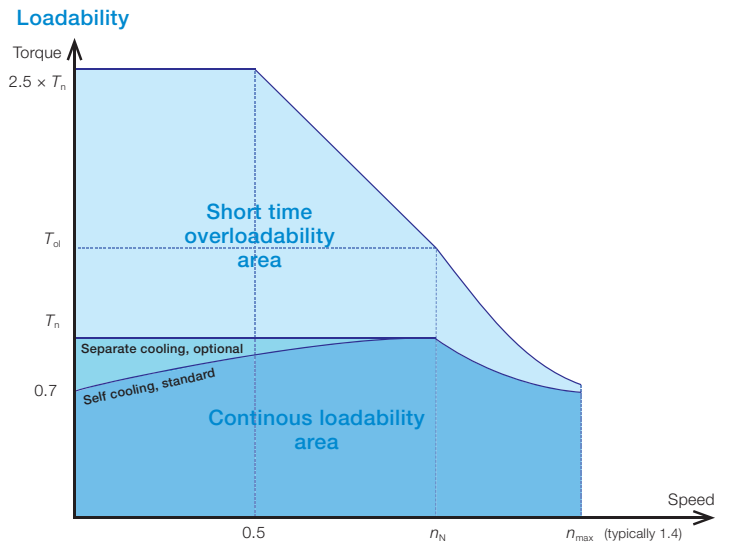


**Same power from smaller size**

# Need more torque?

The SynRM motor-drive package is capable of producing full torque at zero speed and has extremely accurate torque control over the whole speed range

High breakout torque during cold start can be achieved for a short period of time with standard dimensioning. The SynRM motor-drive package can also be dimensioned to produce higher torque and to operate high above the nominal speed.



Torque characteristics of SynRM motors

# Verified SynRM motor-drive package efficiency

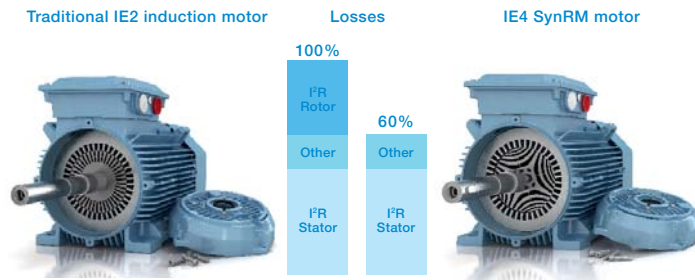
The SynRM motor-drive package efficiency is measured to verify the efficiency of the whole system and not just separate components

The measurements are carried out across the full speed range to make sure you get the true system efficiency at the speeds that you will be running.

Example payback time when comparing IE2 and IE4 packages as new investment

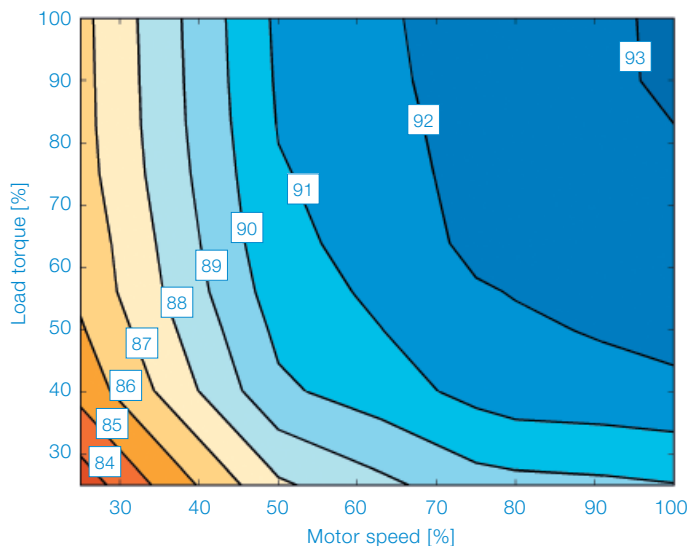
IE4 super premium efficiency package can have a payback time as low as one year. The following table shows the payback time when using the IE4 package.

- Average power 80%
- Energy price 0.12 €/kWh
- Efficiency difference based on IE2 and IE4 limit values
- IE4 SynRM and ACS850 package

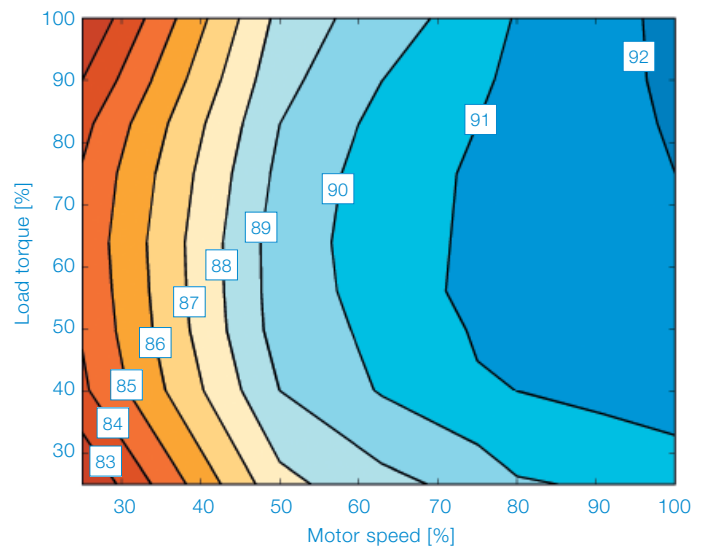


Motor information	with 8,000 annual running hours	with 4,000 annual running hours
37 kW, 1500 rpm	1.6 years	3.2 years
160 kW, 1000 rpm	1.0 year	2.1 years

IE4 SynRM motor reduces losses up to 40 %



IE4 SynRM motor-drive package efficiency (37 kW, 1500 rpm)



High output motor-drive package efficiency (40 kW, 1500 rpm)

# IE4 SynRM motor-drive package

## Technical data

Mechanical construction details and variant codes of M3BL range are based on M3BP motors. **Protection class IP55, self cooling IC411, insulation class F, temperature rise class B.** The motor values given with ACS850 VSD supply.

Output kW			Motor type			Product code			Performance at nominal speed							Suggested frequency converter type for no overload pump and fan use*	Package efficiency IE4 SynRM & ACS850 $T_N=100\%$ , $n_N=100\%$	Typical package efficiency IE2 IM & ACS850 $T_N=100\%$ , $n_N=100\%$
									Speed $n_N$ r/min	Motor efficiency with VSD supply	Current $I_N$ A	Torque $T_N$ Nm	Torque $T_{OL}/T_N$ Nm	Max speed $n_{max}$ r/min	Inertia J kgm <sup>2</sup>			
<b>3000 r/min (100 Hz)</b>															<b>400 V network</b>			
11	M3BL 160	MLA 4	3GBL 162 101-_SC	3000	92.6%	25.0	35	1.5	4200	0.0579	133	ACS850-04-025A-5	90.2%	86.7%				
15	M3BL 160	MLB 4	3GBL 162 102-_SC	3000	93.3%	34.8	48	1.5	4200	0.0579	133	ACS850-04-035A-5	90.5%	87.5%				
18.5	M3BL 160	MLC 4	3GBL 162 103-_SC	3000	93.7%	42.8	59	1.5	4200	0.0579	133	ACS850-04-044A-5	91.4%	88.1%				
22	M3BL 180	MLA 4	3GBL 182 101-_SC	3000	94.0%	50.0	70	1.5	4200	0.0702	160	ACS850-04-050A-5	91.6%	88.5%				
30	M3BL 200	MLA 4	3GBL 202 101-_SC	3000	94.5%	68.8	95	1.5	4200	0.207	259	ACS850-04-078A-5	92.2%	89.2%				
37	M3BL 200	MLB 4	3GBL 202 102-_SC	3000	94.8%	84.6	118	1.5	4200	0.207	259	ACS850-04-094A-5	92.7%	89.6%				
45	M3BL 225	SMA 4	3GBL 222 101-_SC	3000	95.0%	103	143	1.5	4200	0.242	282	ACS850-04-103A-5	92.2%	90.0%				
55	M3BL 225	SMF 4	3GBL 222 102-_SC	3000	95.3%	122	175	1.5	4200	0.242	282	ACS850-04-144A-5	92.6%	89.9%				
<b>1500 r/min (50 Hz)</b>															<b>400 V network</b>			
11	M3BL 160	MLA 4	3GBL 162 104-_SC	1500	93.3%	24.9	70	1.5	2100	0.0702	160	ACS850-04-025A-5	90.9%	87.1%				
15	M3BL 160	MLB 4	3GBL 162 105-_SC	1500	93.9%	33.7	95	1.5	2100	0.0864	177	ACS850-04-035A-5	91.3%	87.9%				
18.5	M3BL 180	MLA 4	3GBL 182 102-_SC	1500	94.2%	42.0	118	1.5	2100	0.0864	177	ACS850-04-044A-5	92.0%	88.4%				
22	M3BL 200	MLF 4	3GBL 202 106-_SC	1500	94.5%	49.1	140	1.5	2100	0.287	304	ACS850-04-050A-5	92.2%	88.8%				
30	M3BL 200	MLA 4	3GBL 202 103-_SC	1500	94.9%	66.7	191	1.5	2100	0.287	304	ACS850-04-078A-5	92.6%	89.4%				
37	M3BL 250	SMF 4	3GBL 252 104-_SC	1500	95.2%	82.0	236	1.5	2100	0.575	428	ACS850-04-094A-5	93.1%	89.8%				
45	M3BL 250	SMG 4	3GBL 252 105-_SC	1500	95.4%	99.5	286	1.5	2100	0.575	428	ACS850-04-103A-5	92.8%	90.2%				
55	M3BL 250	SMA 4	3GBL 252 102-_SC	1500	95.7%	121	350	1.5	2100	0.633	454	ACS850-04-144A-5	93.1%	90.1%				
75	M3BL 280	SMA 4	3GBL 282 213-_DC	1500	96.0%	173	478	2.0	2100	1.00	639	ACS850-04-202A-5	93.6%	90.6%				
90	M3BL 280	SMB 4	3GBL 282 223-_DC	1500	96.1%	202	573	2.1	2100	1.00	639	ACS850-04-202A-5	93.7%	90.8%				
110	M3BL 280	SMC 4	3GBL 282 233-_DC	1500	96.3%	245	699	2.1	2100	1.21	697	ACS850-04-260A-5	93.5%	91.1%				
110	M3BL 315	SMA 4	3GBL 312 213-_DC	1500	96.3%	244	702	2.0	1800	1.64	873	ACS850-04-260A-5	94.0%	91.1%				
132	M3BL 315	SMB 4	3GBL 312 223-_DC	1500	96.4%	290	842	2.0	1800	1.87	925	ACS850-04-290A-5	94.0%	91.3%				
160	M3BL 315	SMC 4	3GBL 312 233-_DC	1500	96.6%	343	1018	1.9	1800	2.04	965	ACS850-04-387A-5	94.2%	91.5%				
200	M3BL 315	MLA 4	3GBL 312 413-_DC	1500	96.7%	427	1272	1.9	1800	2.45	1116	ACS850-04-500A-5	94.5%	91.7%				
250	M3BL 315	LKA 4	3GBL 312 813-_DC	1500	96.7%	542	1591	2.0	1800	3.04	1357	ACS850-04-580A-5	94.1%	91.8%				
315	M3BL 315	LKC 4	3GBL 312 833-_DC	1500	96.7%	650	2006	1.8	1800	3.77	1533	ACS850-04-650A-5	94.1%	92.0%				
<b>1000 r/min (33 Hz)</b>															<b>400 V network</b>			
7.5	M3BL 160	MLA 4	3GBL 162 106-_SC	1000	91.3%	17.3	72	1.5	1400	0.0702	160	ACS850-04-018A-5	89.0%	84.6%				
11	M3BL 160	MLB 4	3GBL 162 107-_SC	1000	92.3%	25.0	105	1.5	1400	0.0864	177	ACS850-04-025A-5	89.8%	86.0%				
15	M3BL 200	MLF 4	3GBL 202 107-_SC	1000	92.9%	34.0	143	1.5	1400	0.242	282	ACS850-04-035A-5	90.4%	87.0%				
18.5	M3BL 200	MLA 4	3GBL 202 104-_SC	1000	93.4%	41.8	177	1.5	1400	0.287	304	ACS850-04-044A-5	91.0%	87.6%				
22	M3BL 200	MLB 4	3GBL 202 105-_SC	1000	93.7%	49.5	210	1.5	1400	0.287	304	ACS850-04-050A-5	91.4%	88.1%				
30	M3BL 250	SMF 4	3GBL 252 106-_SC	1000	94.2%	67.2	286	1.5	1400	0.499	391	ACS850-04-078A-5	91.9%	88.9%				
37	M3BL 250	SMA 4	3GBL 252 103-_SC	1000	94.5%	82.6	353	1.5	1400	0.575	428	ACS850-04-094A-5	92.1%	89.4%				
45	M3BL 280	SMA 4	3GBL 282 212-_DC	1000	94.8%	103	430	2.3	1400	1.00	639	ACS850-04-103A-5	92.0%	89.8%				
55	M3BL 280	SMB 4	3GBL 282 222-_DC	1000	95.1%	123	526	2.0	1400	1.00	639	ACS850-04-144A-5	92.4%	89.8%				
75	M3BL 280	SMC 4	3GBL 282 232-_DC	1000	95.4%	166	715	2.1	1400	1.21	697	ACS850-04-166A-5	93.1%	90.3%				
75	M3BL 315	SMA 4	3GBL 312 212-_DC	1000	95.4%	166	717	2.0	1400	1.64	873	ACS850-04-166A-5	93.1%	90.3%				
90	M3BL 315	SMB 4	3GBL 312 222-_DC	1000	95.6%	198	859	2.0	1400	1.87	925	ACS850-04-202A-5	93.2%	90.6%				
110	M3BL 315	SMC 4	3GBL 312 232-_DC	1000	95.8%	241	1051	1.9	1400	2.04	965	ACS850-04-260A-5	93.4%	90.9%				
132	M3BL 315	MLA 4	3GBL 312 412-_DC	1000	96.0%	279	1261	1.7	1400	2.45	1116	ACS850-04-290A-5	93.7%	91.1%				
160	M3BL 315	LKA 4	3GBL 312 812-_DC	1000	96.2%	340	1527	1.9	1400	3.04	1357	ACS850-04-387A-5	94.0%	91.3%				
200	M3BL 315	LKC 4	3GBL 312 832-_DC	1000	96.3%	418	1910	1.8	1400	3.77	1533	ACS850-04-500A-5	94.0%	91.5%				

\* Consult ABB for motor and drive dimensioning for applications with other load characteristics.



# High output SynRM motor-drive package

## Technical data

Mechanical construction details and variant codes of M3AL range are based on M3AA motors and details of M3BL range are based on M3BP motors. **Protection class IP55, self cooling IC411, insulation class F, temperature rise class F.** The motor values given with ACS850 VSD supply.

Output kW				Motor type				Product code				Performance at nominal speed									
												Speed $n_N$ r/min	Motor efficiency with VSD supply	Current $I_N$ A	Torque $T_N$ Nm	Torque $T_{OL}/$ $T_N$	Max speed $P$ kW	Inertia $J$ kgm <sup>2</sup>	Weight $m$ kg	Suggested ACS850 frequency converter for no overload use*	
<b>3000 r/min (100 Hz)</b>												<b>400 V network</b>									
1.5	M3AL	90	L 4	3GAL 092 001_-SB	3000	84.2%	3.9	4.8	1.5	4200	0.00202	13	ACS850-04-04A8-5								
2.2	M3AL	90	LA 4	3GAL 092 002_-SB	3000	85.9%	5.6	7.0	1.5	4200	0.00202	13	ACS850-04-06A0-5								
3	M3AL	90	LB 4	3GAL 092 003_-SB	3000	87.1%	7.5	9.6	1.5	4200	0.00276	16	ACS850-04-08A0-5								
4	M3AL	90	LC 4	3GAL 092 004_-SB	3000	88.1%	9.8	12.7	1.5	4200	0.00276	16	ACS850-04-010A-5								
5.5	M3AL	90	LDA 4	3GAL 092 005_-SB	3000	89.2%	13.4	17.5	1.5	4200	0.00351	17	ACS850-04-014A-5								
7.5	M3AL	100	LB 4	3GAL 102 001_-SB	3000	90.1%	16.9	23.9	1.5	4200	0.00565	23	ACS850-04-018A-5								
11	M3AL	112	MB 4	3GAL 112 001_-SB	3000	91.2%	25.0	35.0	1.5	4200	0.00813	33	ACS850-04-025A-5								
15	M3AL	132	SMB 4	3GAL 132 001_-SB	3000	91.9%	33.5	47.8	1.5	4200	0.0184	47	ACS850-04-035A-5								
18.5	M3AL	132	SMC 4	3GAL 132 002_-SB	3000	92.4%	41.1	58.9	1.5	4200	0.0226	57	ACS850-04-044A-5								
22	M3AL	132	SMD 4	3GAL 132 003_-SB	3000	92.7%	48.7	70.0	1.5	4200	0.0226	57	ACS850-04-050A-5								
30	M3AL	132	SME 4	3GAL 132 004_-SB	3000	93.3%	68.7	95.5	1.5	4200	0.0277	80	ACS850-04-078A-5								
37	M3AL	132	SMF 4	3GAL 132 005_-SB	3000	93.7%	84.4	118	1.5	4200	0.0332	89	ACS850-04-094A-5								
33	M3BL	160	MLB 4	3GBL 162 001_-SB	3000	93.5%	76.7	105	1.5	4200	0.0579	130	ACS850-04-078A-5								
40	M3BL	160	MLC 4	3GBL 162 002_-SB	3000	93.9%	92.5	127	1.5	4200	0.0702	157	ACS850-04-094A-5								
45	M3BL	160	MLE 4	3GBL 162 003_-SB	3000	94.6%	103	143	1.5	4200	0.0864	174	ACS850-04-103A-5								
62	M3BL	200	MLA 4	3GBL 202 001_-SB	3000	95.1%	144	197	1.5	4200	0.242	279	ACS850-04-144A-5								
72	M3BL	200	MLC 4	3GBL 202 002_-SB	3000	95.4%	166	229	1.5	4200	0.287	304	ACS850-04-166A-5								
97	M3BL	250	SMA 4	3GBL 252 001_-SB	3000	95.2%	224	309	1.5	4000	0.499	396	ACS850-04-225A-5								
112	M3BL	250	SMB 4	3GBL 252 007_-SB	3000	95.3%	259	357	1.5	4000	0.575	428	ACS850-04-260A-5								
125	M3BL	250	SMC 4	3GBL 252 002_-SB	3000	95.5%	288	398	1.5	4000	0.633	454	ACS850-04-290A-5								
<b>2100 r/min (70 Hz)</b>												<b>400 V network</b>									
25	M3BL	160	MLB 4	3GBL 162 007_-SB	2100	92.3%	58.8	114	1.5	2940	0.0579	130	ACS850-04-061A-5								
31	M3BL	160	MLC 4	3GBL 162 008_-SB	2100	93.0%	72.4	141	1.5	2940	0.0702	157	ACS850-04-078A-5								
39	M3BL	160	MLE 4	3GBL 162 009_-SB	2100	93.7%	90.4	177	1.5	2940	0.0864	174	ACS850-04-094A-5								
44	M3BL	200	MLA 4	3GBL 202 005_-SB	2100	93.8%	102	200	1.5	2940	0.242	279	ACS850-04-103A-5								
62	M3BL	200	MLC 4	3GBL 202 006_-SB	2100	94.0%	143	282	1.5	2940	0.287	304	ACS850-04-144A-5								
88	M3BL	250	SMA 4	3GBL 252 005_-SB	2100	95.0%	201	400	1.5	2940	0.499	396	ACS850-04-202A-5								
98	M3BL	250	SMB 4	3GBL 252 008_-SB	2100	95.2%	224	446	1.5	2940	0.575	428	ACS850-04-225A-5								
115	M3BL	250	SMC 4	3GBL 252 006_-SB	2100	95.5%	258	523	1.5	2940	0.633	454	ACS850-04-260A-5								
124	M3BL	280	SMA 4	3GBL 282 215_-DB	2100	95.2%	259	564	1.6	2400	0.857	604	ACS850-04-260A-5								
134	M3BL	280	SMB 4	3GBL 282 225_-DB	2100	95.5%	279	609	1.7	2400	1.00	639	ACS850-04-290A-5								
160	M3BL	280	SMC 4	3GBL 282 235_-DB	2100	95.8%	329	728	1.7	2400	1.21	697	ACS850-04-387A-5								
<b>1500 r/min (50 Hz)</b>												<b>400 V network</b>									
1.1	M3AL	90	LA 4	3GAL 092 006_-SB	1500	81.4%	2.9	7.0	1.5	2100	0.00202	13	ACS850-04-03A0-5								
1.5	M3AL	90	LB 4	3GAL 092 007_-SB	1500	82.8%	3.8	9.6	1.5	2100	0.00276	16	ACS850-04-04A8-5								
2.2	M3AL	90	LDA 4	3GAL 092 008_-SB	1500	84.3%	5.5	14.0	1.5	2100	0.00351	17	ACS850-04-06A0-5								
3	M3AL	100	LB 4	3GAL 102 002_-SB	1500	85.5%	7.1	19.1	1.5	2100	0.00565	23	ACS850-04-08A0-5								
4	M3AL	100	LDA 4	3GAL 102 003_-SB	1500	86.6%	9.4	25.5	1.5	2100	0.00690	27	ACS850-04-010A-5								
5.5	M3AL	112	MB 4	3GAL 112 002_-SB	1500	87.7%	13.1	35.0	1.5	2100	0.00813	33	ACS850-04-014A-5								
7.5	M3AL	132	SMB 4	3GAL 132 006_-SB	1500	88.7%	17.4	47.7	1.5	2100	0.0184	47	ACS850-04-018A-5								
11	M3AL	132	SMC 4	3GAL 132 007_-SB	1500	89.8%	25.0	70.0	1.5	2100	0.0226	57	ACS850-04-025A-5								
15	M3AL	132	SME 4	3GAL 132 008_-SB	1500	90.6%	34.5	95.5	1.5	2100	0.0277	80	ACS850-04-035A-5								
18.5	M3AL	132	SMF 4	3GAL 132 009_-SB	1500	91.2%	42.2	118	1.5	2100	0.0332	89	ACS850-04-044A-5								
17	M3BL	160	MLB 4	3GBL 162 004_-SB	1500	91.2%	42.6	108	1.5	2100	0.0579	130	ACS850-04-044A-5								
20	M3BL	160	MLC 4	3GBL 162 005_-SB	1500	92.0%	49.2	127	1.5	2100	0.0702	157	ACS850-04-050A-5								
25	M3BL	160	MLE 4	3GBL 162 006_-SB	1500	92.8%	58.5	159	1.5	2100	0.0864	174	ACS850-04-061A-5								
33	M3BL	200	MLA 4	3GBL 202 003_-SB	1500	93.2%	76.9	210	1.5	2100	0.242	279	ACS850-04-078A-5								
40	M3BL	200	MLC 4	3GBL 202 004_-SB	1500	93.5%	92.9	255	1.5	2100	0.287	304	ACS850-04-094A-5								
71	M3BL	250	SMA 4	3GBL 252 003_-SB	1500	94.3%	166	452	1.5	2100	0.499	396	ACS850-04-166A-5								
86	M3BL	250	SMB 4	3GBL 252 009_-SB	1500	94.6%	200	547	1.5	2100	0.575	428	ACS850-04-202A-5								
97	M3BL	250	SMC 4	3GBL 252 004_-SB	1500	95.0%	225	618	1.5	2100	0.633	454	ACS850-04-225A-5								
103	M3BL	280	SMA 4	3GBL 282 213_-DB	1500	94.8%	221	656	1.5	2100	0.857	604	ACS850-04-225A-5								
118	M3BL	280	SMB 4	3GBL 282 223_-DB	1500	95.3%	246	758	1.5	2100	1.00	639	ACS850-04-260A-5								
134	M3BL	280	SMC 4	3GBL 282 233_-DB	1500	95.6%	279	853	1.7	2100	1.21	697	ACS850-04-290A-5								
155	M3BL	315	SMA 4	3GBL 312 213_-DB	1500	95.7%	321	987	1.5	1800	1.64	873	ACS850-04-387A-5								
180	M3BL	315	SMB 4	3GBL 312 223_-DB	1500	96.0%	374	1146	1.5	1800	1.87	925	ACS850-04-387A-5								
205	M3BL	315	SMC 4	3GBL 312 233_-DB	1500	96.1%	423	1305	1.5	1800	2.04	965	ACS850-04-500A-5								
250	M3BL	315	MLA 4	3GBL 312 413_-DB	1500	96.4%	516	1592	1.5	1800	2.45	1116	ACS850-04-580A-5								
275	M3BL	315	MLB 4	3GBL 312 423_-DB	1500	96.5%	573	1751	1.6	1800	2.68	1169	ACS850-04-580A-5								
315	M3BL	315	LKA 4	3GBL 312 813_-DB	1500	96.4%	659	2005	1.6	1800	3.04	1357	ACS850-04-710A-5								
350	M3BL	315	LKC 4	3GBL 312 833_-DB	1500	96.5%	712	2228	1.7	1800	3.77	1533	ACS850-04-710A-5								

\* Consult ABB for motor and drive dimensioning for applications with other load characteristics.

# Contact us

For more information contact your  
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ABB SynRM video

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