SynRM² motor concept for variable speed applications
IE4 – IE5 efficiency and beyond without rare earth magnets
Tailored motor solutions for OEMs

Increasing demands for efficiency are forcing OEMs to find new solutions to reduce energy consumption. Often the most economical way is to increase motor efficiency and apply speed control.

Responding to these needs, ABB launched its magnet-free IE4 synchronous reluctance (SynRM) motor technology in 2011. Even though the IE4 efficiency level was not officially established until the beginning of 2014, some industry segments are already requiring efficiency levels above IE4. ABB's answer to these demands is to extend the award winning SynRM technology. The SynRM² technology platform can further reduce motor losses, enabling IE5 Ultra Premium efficiency and even beyond. For OEMs this avoids the need for costly design changes to their products.

Ferrite assisted synchronous reluctance motor concept
The new technology platform utilizes permanent magnets but avoids the need for the expensive rare earth magnets used in conventional permanent magnet motor technology. Rare earth magnets can deliver very high performance, but the cost of the magnets makes the motors very expensive. ABB's approach uses cost-effective ferrite magnets to further improve the performance of the SynRM motor concept. Performance is increased to the same level as in rare earth permanent magnet motors, but ferrite magnets are more cost effective and easier to source. The result is an offering that is economically and ecologically more sustainable.

The focus of the new technology platform is in the 0.55–18,5kW power and 1000–5400 rpm speed ranges. Performance examples for IE4 and IE5 are listed in the back side.

The SynRM² technology platform offers great flexibility, enabling technical and commercial characteristics to be optimized to meet customer requirements. All SynRM² motors are tailored on the basis of customer specifications.

Beyond IE5
The SynRM² has been demonstrated to meet even IE6 "Hyper premium efficiency" making this technology platform very future proof. An IE6 motor would have yet another 20% reduction of losses compared to an IE5 motor.

Package with ABB drive
When buying both motors and drives from ABB, we take full responsibility for ensuring a perfect match.

Broad hardware portfolio and application expertise
The new technology concept can be applied to a variety of ABB hardware platforms in order to find the most suitable customer specific offering.

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Mechanical construction details are based on process Performance M3AA and Synchronous reluctance M3AL motors. Protection class IP55, self cooling IC411, insulation class F, temperature rise class B. The motor values given with ACS880 VSD supply.

Technical data for IE5 SynRM[2]

Output	Frame size	Speed nN	Frequency f_el	Efficiency *)	Current I_N	Torque T_N
kW		r/min	Hz	%	A	Nm
3000 r/min		**400V network voltage**				
0.75	H71	3000	100	86.3	1.43	2.39
1.1	H71	3000	100	87.8	2.14	3.50
1.5	H80	3000	100	88.9	2.88	4.78
2.2	H80	3000	100	90.2	4.07	7.00
3	H90	3000	100	91.1	5.50	9.55
4	H90	3000	100	91.8	7.35	12.7
5.5	H100/112	3000	100	92.6	9.83	17.5
7.5	H132	3000	100	93.2	13.5	23.9
11	H132	3000	100	94.0	19.8	35.0
15	H132	3000	100	94.6	27.2	47.8
18.5	H132	3000	100	94.9	33.1	58.9
1500 r/min		**400V network voltage**				
0.55	H80	1500	50	86.7	1.06	3.50
0.75	H80	1500	50	88.2	1.44	4.78
1.1	H90	1500	50	89.5	2.01	7.00
1.5	H90	1500	50	90.3	2.83	9.55
2.2	H100/112	1500	50	91.4	4.06	14.0
3	H100/112	1500	50	92.2	5.56	19.1
4	H100/112	1500	50	92.8	7.38	25.5
5.5	H132	1500	50	93.4	10.4	35.0
7.5	H132	1500	50	94.0	13.8	47.8
11	H132	1500	50	94.6	20.2	70.0
15	H160	1500	50	95.1	27.4	95.5
18.5	H160	1500	50	95.3	33.4	118

*) Motor-only efficiency with frequency converter supply

Technical data for IE4 SynRM[2]

Output	Frame size	Speed nN	Frequency f_el	Efficiency *)	Current I_N	Torque T_N
kW		r/min	Hz	%	A	Nm
3000 r/min		**400V network voltage**				
0.75	H71	3000	100	83.5	1.50	2.39
1.1	H71	3000	100	85.2	2.16	3.50
1.5	H80	3000	100	86.5	2.99	4.78
2.2	H80	3000	100	88.0	4.32	7.00
3	H80	3000	100	89.1	5.62	9.55
4	H90	3000	100	90.0	7.42	12.7
5.5	H100/112	3000	100	90.9	10.1	17.5
7.5	H100/112	3000	100	91.7	14.1	23.9
11	H132	3000	100	92.6	20.1	35.0
15	H132	3000	100	93.3	27.9	47.8
18.5	H132	3000	100	93.7	34.2	58.9
1500 r/min		**400V network voltage**				
0.55	H71	1500	50	83.9	1.14	3.50
0.75	H80	1500	50	85.7	1.48	4.78
1.1	H80	1500	50	87.2	2.23	7.00
1.5	H90	1500	50	88.2	2.87	9.55
2.2	H90	1500	50	89.5	4.24	14.01
3	H100/112	1500	50	90.4	5.54	19.10
4	H100/112	1500	50	91.1	7.43	25.5
5.5	H100/112	1500	50	91.9	10.6	35.0
7.5	H132	1500	50	92.6	14.0	47.8
11	H132	1500	50	93.3	20.4	70.0
15	H132	1500	50	93.9	27.7	95.5
18.5	H160	1500	50	94.2	34.0	117.8

*) Motor-only efficiency with frequency converter supply

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