

IE Motor Efficiency Classes IE1-IE5 (IEC 60034-30-1)

cBallast · IEC 60034-30-1:2014 + EU 2019/1781

IE class ladder

Class	Name	Nom eff 4-pole 11 kW 50 Hz
IE1	Standard	87.6%
IE2	High	89.8%
IE3	Premium	91.4%
IE4	Super-Premium	92.6%
IE5	Ultra-Premium	93.8% target

EU MEPS timeline

Date	Range	Min class
2015-01-01	0.75-375 kW 2/4/6p	IE3 or IE2+VFD
2021-07-01	0.75-1000 kW 2/4/6/8p	IE3 (no VFD exemption)
2023-07-01	75-200 kW 2/4/6p	IE4
2027 (proposed)	0.12-1000 kW	IE4 across

Part-load efficiency

Nameplate IE measured at 100% load. Centrifugal pump/fan (variable torque) typically 60-80% load. IE3 + IE4 keep curve flatter across 50-100%; IE1 + IE2 drop 3-6 pp at 50%. Compare part-load curve, not nameplate 100%, for lifecycle cost.

VFD supply impact

VFD delivers PWM waveform. Harmonic losses reduce effective efficiency 1-3 pp below sinusoidal nameplate. EU regulation defines IES class ladder for VFD+motor system. IE3 motor + IE2 VFD: verify combined system efficiency at operating point on IES datasheet.

Cost / payback

IE2 !' IE3 on 30 kW / 6000 h/yr: +8-15% price, 12-24 mo payback. IE3 !' IE4: +15-25% price, 24-48 mo. Always-on services (24/7 pumps, cooling fans) make even IE5 economic.

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