Environmental Product Declaration

Three-phase asynchronous motors
Design series IE3-W4..
0.75 kW to 90 kW

IE3

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VEM

General information

Manufacturer

VEM motors Thurm GmbH
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VEM motors GmbH
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The companies belong to the VEM Holding GmbH, which is operating 6 production sites in Europe and 5 international sales companies. Both companies belong to the business line low-voltage motors of VEM Holding GmbH.

Product description

The design series IE3-W41. includes the sizes 80, 90, 100, 112, 132, 160, 180, 200, 225, 250, 280 and 315. The output range is between 0.75 kW and 90 kW in the voltage range from 220 V up to 725 V. Characteristic applications can be found in plant engineering, materials handling technology, energy and environmental engineering, heating and climate engineering as well as traffic engineering. This document has been issued for three representative motor types.

IE3-W41R 90 S4
1,1 kW; 1500 r.p.m.; 400/690 V D/Y, 50 Hz
efficiency at 100% load 84,1 %

IE3-W41R 160 M4
11 kW; 1500 r.p.m.; 400/690 V D/Y, 50 Hz
efficiency at 100% load 91,4 %

IE3-W41R 280 M4
90 kW; 1500 r.p.m.; 400/690 V D/Y, 50 Hz
efficiency at 100% load 95,1 %

Environmental characteristics

Used materials

Motor type	IE3-W41R 90 S4		IE3-W41R 160 M4		IE3-W41R 280 M4	
Material	kg/product	kg/kW	kg/product	kg/kW	kg/product	kg/kW
Electric sheet steel	12.11	11.01	43.81	3.98	329.90	3.67
Other steel materials	2.17	1.97	13.46	1.22	535.74	5.95
Cast iron	10.78	9.80	49.10	4.46	292.28	3.25
Aluminium	0.88	0.80	4.24	0.39	17.10	0.19
Copper	1.96	1.78	10.15	0.92	41.52	0.46
Insulation material	0.10	0.09	0.70	0.06	3.65	0.04
Insulation resin	0.10	0.09	0.17	0.02	2.30	0.03
Varnish/paints	0.08	0.07	0.33	0.03	1.08	0.01
Packaging materials	0.70	0.64	0.80	0.07	1.50	0.02

Reliability data

Mean time between failure θ = 40,000 h
γ percentage life-time $T\gamma$ = 15 a for γ =50
γ percentage effective life-time
$T\gamma$ = 90,000 h for γ = 50
Interval between maintenance
2-pole motors = 10,000 h
4-pole motors = 20,000 h
Maintenance time T_v = 2 h
Wear parts bearing system
Average repair time T_v = 20 h

Average failure time for winding
θ_{1W} = 40,000 h
Calculated bearing life-time when observing permitted loads (data see catalogue) = 20,000 h

All data and calculations below are based on the **Final Report „Methodology for Ecodesign of Energy-related Products MEErP 2011“** dated 28th November 2011 and on the corresponding Excel calculation chart „ecoreport2011“.
A life-time of 15 years has been taken into account with an estimated average service life of 3,000 h.
For the calculation of the energy consumption during manufacture, operation and disposal phase a German energy mix was taken as basis.
For 2012 the energy mix consists of:
11% domestic gas, 19% black coal, 16% nuclear energy, 26% brown coal, 22% renewable energy and 6% other (Source: AG Energiebilanzen, BMU edition: 3/2013).
The operation point selected for service life corresponds to the rated data of the motor. In real life the operation point can be subject to noticeable fluctuations.

Energy consumption and losses

IE3-W41R 90 S4	kWh/product			kWh/kW		
Type of energy	**Manufacture**	**Service life**	**Disposal**	**Manufacture**	**Service life**	**Disposal**
Electrical energy	79.17	$1.51 \cdot 10^5$	-	71.97	$1.37 \cdot 10^5$	-
Thermal energy	332.50	3.05	12.78	302.27	2.77	11.62

IE3-W41R 160 S4	kWh/product			kWh/kW		
Type of energy	**Manufacture**	**Service life**	**Disposal**	**Manufacture**	**Service life**	**Disposal**
Electrical energy	295.28	$3.02 \cdot 10^5$	-	26.84	$2.74 \cdot 10^5$	-
Thermal energy	1357.50	12.50	68.89	123.41	1.14	6.26

IE3-W41R 280 M4	kWh/product			kWh/kW		
Type of energy	**Manufacture**	**Service life**	**Disposal**	**Manufacture**	**Service life**	**Disposal**
Electrical energy	2710.56	$3.02 \cdot 10^5$	-	30.12	$0.34 \cdot 10^5$	-
Thermal energy	9970.28	91.67	853.23	110.78	1.02	9.48

Klassifizierungsdaten für Emissionen

IE3-W41R 90 S4 Environmental effects	Equivalent unit	Production phase	Utilization phase	Total life-time cycle
Global warming potential, GWP	kg CO_2 /kW	110.91	21083.64	21203.64
Acidification potential, AP	g SO_2 /kW	1257.27	93304.55	94586.36
Eutrophization	g PO_4 / kW	28.18	93.64	121.82
Heavy metals (water)	mg Hg/20 / kW	1140	2137.27	3278.18
Heavy metals (air)	mg Ni /kW	1824.55	2137.27	3278.18

IE3-W41R 160 S4 Environmental effects	Equivalent unit	Production phase	Utilization phase	Total life-time cycle
Global warming potential, GWP	kg CO_2 /kW	43.91	4217.00	4262.09
Acidification potential, AP	g SO_2 /kW	542.00	18663.73	19209.45
Eutrophization	g PO_4 / kW	10.09	18.73	28.82
Heavy metals (water)	mg Hg/20 / kW	440.82	429.64	870.45
Heavy metals (air)	mg Ni /kW	678.73	1005.27	1684.73

IE3-W41R 280 M4 Environmental effects	Equivalent unit	Production phase	Utilization phase	Total life-time cycle
Global warming potential, GWP	kg CO_2 /kW	42.71	515.74	558.94
Acidification potential, AP	g SO_2 /kW	396.02	2284.26	2681.77
Eutrophization	g PO_4 / kW	9.32	2.38	11.70
Heavy metals (water)	mg Hg/20 / kW	374.61	55.71	430.32
Heavy metals (air)	mg Ni /kW	613.94	127.98	742.14

Recycling and disposal

The machine contains no hazardous substances according to EU directive 2011/65/EU.

Criteria for hazardous substances are defined as follows: carcinogenic, mutagenic, toxic, poisonous, radioactive, hazardous to water, climate-changing, ozone-depleting, especially all substances complying with the chemical law and hazardous substances directive, annex VI “Exemptions for manufacturing and usage”.

When disposing the machines the national regulations must be observed.
In addition please take care to observe the ordinance of waste oils when disposing used oils and greases. These substances must not be contaminated with solvents, cold cleaner and residues of paint.

Before transfer to the recycling stations the individual materials should be separated. Main materials are grey cast iron (housing), steel (shaft, stator and rotor sheets, small parts), aluminium (stator), copper (windings) and plastics (insulation material, i.e. polyamide, polypropylene, etc.). Electronic components like circuit boards (inverter, encoder, etc.) are recycled separately.

Utilization phase compared to total life-time

It must be noted that the effect on environment is biggest during utilization phase. This results from the fact that motors are an energy consuming device. The GWP of the utilization phase is therefore many times higher than during production and disposal phase.

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