ELECTRIC DRIVES
FOR EVERY DEMAND

Catalogue 2017/2018

VEMoDRIVE
Frequency Converter VSI2.0

VEMoDRIVE Single – Low voltage
0,55 kW – 3000 kW

ELECTRIC DRIVES

FOR EVERY DEMAND

- **Transportation**
- **Machine and plant engineering**
- **Steel and rolling mills**
- **Cement and mining industry**
- **Shipbuilding**
- **Chemical, oil and gas industry**
- **Water management**
- **Renewable energy**
- **Power plant technology**

There are currently around 30 million electric machines bearing the VEM badge in use around the world. They are found aboard ships, in trains and trams, and in chemical plants and rolling mills. VEM generators produce electricity in hydropower plants and wind farms.

The VEM product range embraces variable-speed electric drive systems, special motors and special machines for outputs ranging from 0.06 kW to 42 MW, as well as a diversity of drive technology and power generation components.

VEMoDRIVE Frequency Converter VSI2.0

VEMoDRIVE Single – Low voltage

0.55 kW – 3000 kW

Contents

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VEMoDRIVE frequency converter VSI2.0

The VEMoDRIVE frequency converter VSI2.0 meets the requirements of a broad diversity of industrial applications. The main fields of application are variable-speed drives for

- pumps
- fans
- rotary kilns
- conveyors
- choppers and refiners
- compressors
- crane systems and lifts
- mixers
- grinding mills
- test benches
- sifters
- winders
- centrifuges

VEMoDRIVE frequency converters can be supplied either for wall mounting or as ready-assembled cabinet systems. They cover an output range from 0.55 kW to 3 MW and can be supplied with input voltages from 230 to 690 V, depending on the series and output class.

Your benefits:

- Consistent, user-friendly operating concept
- Degree of protection IP 20, IP 21, IP 23 and IP 54, depending on the series
- Air and liquid cooling
- Service-friendly modular design
- Integrated EMC mains filter (industrial)

Type designation

VSI2.0	C	SA	1	–	4	/	0090	A	+Z
1	2	3	4		5		6	7	8

1: Series	VSI2.0	VEMoDRIVE Voltage Source Inverter
2: Version	W	Wall-mounted
	C	Cabinet
3: Power supply	SA	6-pulse
	SB	12-pulse
	LH	Low harmonic
	RP	4-quadrant, regenerative power capability
4: Type*	1	SD (up to 3 MW, 230 – 690 V)
	2	HD (up to 3 MW, 230 – 690 V)
	8	SD (up to 18.5 kW, 230 V – 400 V)
	9	HD (up to 18.5 kW, 230 V – 400 V)
5: Voltage U_N	4	230 V ≤ U_N ≤ 480 V
	5	400 V ≤ U_N ≤ 525 V
	6	400 V ≤ U_N ≤ 690 V
6: Current I_N	0002	2.5 A
	:	
	3000	3000 A
7: Type of cooling	A	Air-cooled
	L	Liquid-cooled
8: Additional options	See manual for further details	

* Type abbreviations: SD = Standard Dynamic, HD = High Dynamic, further explanation on page 8

VSI2.0**W**

VSI2.0**C**

General overview

VEMoDRIVE Single – Low voltage

VSI2.0 – Type*	1 (SD) / 2 (HD)	8 (SD) / 9 (HD)	LH (Low Harmonic) / RP (Regenerative Power)
Output (kW)	0.55 – 3000	0.55 – 18.5	55 – 1100
Mains voltage (V)	230 – 690	230 – 480	380 – 690
Degree of protection			
Wall-mounted system	IP 54 (0.55 – 200 kW) IP20/21 (11 – 160 kW)	IP 20 (0.55 – 18.5 kW)	–
Cabinet system	IP 21/23/54	–	IP 54
Control mode*	SD: U/f HD: Direct torque control or U/f	SD: U/f HD: Direct torque control or U/f	SD: U/f HD: Direct torque control or U/f
EMC filter	C3 as standard (C2 optional)	C3 as standard (C2 optional)	LCL filter
Operator control panel	Detachable, multi language	Detachable, multi language	Detachable, multi language
Available options, see page 25 for full list	Encoder, STO (Safe Torque Off), standby power supply, coated boards, various motor filters, brake chopper, PTC / PT100-terminals, control panel for the cabinet door, CRIO (crane option, HD only), all typical communication/bus interfaces, liquid cooling (nominal currents ≥ 90 A), 12-pulse version (not applicable for type LH/RP)		
CE certification	All sizes	All sizes	All sizes
UL certification cULus certification	UL-/cUL-approved up to and including 1000 A / 480 V and 1500 A / 480 V (further sizes pending)	–	In near future
Certification for marine sector	DNV BV for all sizes E and above	–	In near future
EAC (replaces GOST R)	All sizes	All sizes	In near future

* SD = Standard Dynamic, HD = High Dynamic, further explanation on page 8

Frequency converters for every application: VEMoDRIVE VSI2.0

Benefits:

- **Compact design:**
  Through the incorporation of rectifier and inverter into a single module, VSI2.0 frequency converters are favourably priced in all sizes and possess a high power density.
- **Flexible use:**
  Converters for smaller outputs are accommodated in a robust metal housing for wall mounting (degree of protection IP 20/21/54), while those for higher outputs are supplied as a cabinet system (degree of protection IP 21/23/54).
- **Interference immunity:**
  Integration of an EMC filter (category C3 up to 80 m motor cable) as standard
- **Energy-efficient:**
  The power losses of the VSI2.0 lie significantly below 75% of the losses of the reference converter according to EN 50598-2 (applicable since May 2015) and thus reliably meet the requirements of efficiency class IE2. In combination with IE2 motors from VEM, the drive system (PDS) meets the requirements of efficiency class IES2.
- **Multiple languages:**
  A detachable, multi-language control panel is included as standard. The following languages are supported: German, English, Swedish, Dutch, French, Spanish, Russian, Italian, Czech and Turkish (further languages by request).
- **Customer-specific:**
  The operating parameters can be set to process-specific units, e.g. m/s, t/h or cycles/min for dynamic applications or m^3/min and bar for pumps and fans.
- **Drives and brakes in one:**
  An integrated brake chopper is available for all models. Converters with regenerative power capabilities (AFE, 4Q operation) can also be supplied.
- **Certification:**
  Versions with UL approval (UL 840) and marine certification (DNV) are available (types 1+2).
- **Effective cooling:**
  In addition to the standard air cooling, it is possible to provide liquid cooling for converters with nominal currents $I_N \geq 90$ A.
- **Minimal mains pollution:**
  The consistent use of DC link reactors serves to limit mains pollution (types 1+2, THDi 30–40%).
  In addition, there are 12-pulse versions of many cabinet-systems ($I_N \geq 250$ A, THDi 10–12%) and low-harmonic converters ($I_N \geq 109$ A, THDi ≤ 5%) available.

High dynamic response for demanding applications: VEMoDRIVE VSI2.0-HD

VEMoDRIVE frequency converters of the HD series function with direct torque control. This enables highly dynamic torque settings and precise speed control. Even without the optionally available brake chopper, the HD models possess a vector braking function (braking power realised in the motor). The HD series is thus an ideal solution for demanding applications such as test stands, cranes, crushers, grinding mills, mixers and centrifuges.

Energy savings for pumps and fans: VEMoDRIVE VSI2.0-SD

VEMoDRIVE frequency converters of the favourably priced SD series were developed specifically for drives in pump, fan and compressor applications. The converter provides for continuous adaptation of the motor speed to the required output, which serves to minimise both energy consumption and wear. The intelligent monitoring function protects your processes against damage and unplanned downtimes.

Further benefits for your application:
- Soft starting minimises the starting current and adjustable speed ramps avoid pressure shocks.
- In addition to the controlled motor, a VSI2.0-SD converter is able to switch six further pump or fan motors via contactors in accordance with the desired flow rate (with the optional I/O board). An energy-saving function switches the individual motors off automatically if they are not required in order to maintain the desired pressure or flow rate.
- Numerous process-specific functions are already integrated into the VSI2.0-SD, e.g. operation at maximum speed at defined intervals in order to flush out accumulated sludge.

Notes on configuration for pumps and fan drives:
With rotary pumps and fans, a higher drive speed often enables the use of a smaller driven machine with better efficiency. Most pumps and fans can be operated at speeds above their rated speed without problems, provided the specified maximum speed is not exceeded.

Generally, the power factor and often also the efficiency of a motor will be better with a smaller number of poles. This often allows for a smaller converter with reduced losses. The total heat loss of the overall drive system is thus lower, and energy costs can also be reduced significantly.

Low mains pollution and power regeneration capabilities: VEMoDRIVE VSI2.0-LH/RP

VEMoDRIVE frequency converters of the LH series (Low Harmonic) drive your motors reliably wherever high demands are to be met with regard to mains-side current harmonics (THDi ≤ 5% acc. to IEEE-519). In addition to the benefit of low mains pollution, the power regeneration capabilities of the frequency converters of the RP series permit frequent operation in braking mode or even permanent energy recovery for input to the grid. The elimination of braking resistors reduces the required cooling performance and saves energy costs.

Alongside drive control, the LH and RP series also provide for mains-side power factor correction. The voltage boost from the active front end (AFE) enables the full motor power to be made available even through voltage dips by up to 15%, or else you can operate your drives with full torque at 20% higher speeds.
Both series (LH+RP) are supplied both in Standard Dynamic (SD) versions for pump and fan drives and in High Dynamic (HD) versions for demanding applications.

12-pulse version – reduced mains pollution with diode front end: VEMoDRIVE VSI2.0CSB

The 12-pulse version combined with a three-winding transformer allows you to reduce the mains-side THDi from 30–40% (6-pulse) to 10–12% (more details on page 31). The VSI2.0CSB have the same performance data as the converters with 6-pulse diode front end VSI2.0CSA. Only the dimensions and weight of the cabinets change, see pages 12 and 16.

Notes on configuration of VEMoDRIVE frequency converters

The recommended rated motor power P_{Motor} specified in the following tables applies for asynchronous motors (VEM squirrel-cage motors, IE2, 4-pole) in full-load operation.

In case of deviating operating conditions, the converter should be selected in accordance with the required motor current, overload current and overload time.

Technical data

The products featured in this catalogue are also to be found in our electronic catalogue VEMeKAT at www.vem-group.com (Products/Low voltage).

VEMoDRIVE VSI2.0 – HD (High Dynamic)

General information on the High Dynamic series:

- Sound pressure level < 78 dB(A) at a distance of 1 m
- Nominal data applicable at 40 °C ambient temperature
- Type 2 systems (WSA2) possess a DC link reactor as standard (contrary to type 9 systems)
- All cabinet systems are designed with switch-disconnectors (6-pulse) or motor-operated circuit-breakers (12-pulse)

VSI2.0 type 2 (HD High Dynamic), wall-mounted, IP 20

Frequency converter	Max. output current*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min. every 10 min)		Power loss for normal duty	Size	Remarks
Type designation	I_{max}	P_{Motor} (kW)	I_N (A)	P_{Motor} (kW)	I_N (A)	P_V (W)		
		Nominal data apply for U_n = 400 V						
VSI2.0WSA9-4/0002A	3.8	0.75	2.5	0.75	2	52.5	A3	Brake chopper integrated Line reactor optional Input power factor: 0.7 – 0.8
VSI2.0WSA9-4/0003A	5.1	1.1	3.4	1.1	2.7	77		
VSI2.0WSA9-4/0004A	6.2	1.5	4.1	1.1	3.3	105		
VSI2.0WSA9-4/0006A	8.4	2.2	5.6	1.5	4.5	154		
VSI2.0WSA9-4/0007A	10.8	3	7.2	2.2	5.8	210		
VSI2.0WSA9-4/0009A	14.3	4	9.5	3	7.6	280		
VSI2.0WSA9-4/0010A	18	5.5	12	4	9.6	385		
VSI2.0WSA9-4/0016A	24	7.5	16	5.5	12.8	525	B3	
VSI2.0WSA9-4/0023A	34.5	11	23	7.5	18.4	770		
VSI2.0WSA9-4/0031A	46.5	15	31	11	24.8	750	C3	
VSI2.0WSA9-4/0038A	56	18.5	38	15	30.4	925		
VSI2.0WSA2-4/0025A	38	11	25	7.5	20	220	C2	Brake chopper optional DC link reactor integrated Input power factor: 0.95 IP 21 optional
VSI2.0WSA2-4/0030A	45	15	30	11	24	300		
VSI2.0WSA2-4/0036A	54	18.5	36	15	29	370		
VSI2.0WSA2-4/0045A	68	22	45	18.5	36	440		
VSI2.0WSA2-4/0058A	90	30	58	22	46	600		
VSI2.0WSA2-4/0072A	108	37	72	30	58	740	D2	
VSI2.0WSA2-4/0088A	132	45	88	37	70	900		
VSI2.0WSA2-4/0105A	132	55	105	45	85	1.100		
VSI2.0WSA2-4/0142A	170	75	142	55	114	1.500	E2	
VSI2.0WSA2-4/0171A	205	90	171	75	137	1.800		
VSI2.0WSA2-4/0205A	246	110	205	90	164	2.200	F2	
VSI2.0WSA2-4/0244A	293	132	244	110	195	2.640		
VSI2.0WSA2-4/0293A	352	160	293	132	235	3.200		

* Available for a limited time, insofar as the drive temperature permits

Dimensions

Size	Height		Width	Depth	Weight	Cooling air flow	Remarks
	H1 (mm)	H2 (mm)	B (mm)	T (mm)	(kg)	(m^3/h)	
A3	220	287	120	169	2,6	39	
B3	255	325	145	179	3,9	89	
C3	335	407	190	187	5	177	
C2	447	536	176	267	17	120	25 A – 30 A
					17	170	36 A – 58 A
D2	545	658	220	291	30	170	
E2	956	956	275	294	53	510	
F2	956	956	335	294	68	800	

H1 = Housing height; H2 = Overall height including cable connections

VSI2.0 type 2 (HD High Dynamic), wall-mounted, IP 54

Frequency converter	Max. output current*	Normal duty (120% 1 min. every 10 min)		Heavy duty (150% 1 min. every 10 min)		Power loss for normal duty	Size
Type designation	I_{max}	P_{Motor} (kW)	I_N (A)	P_{Motor} (kW)	I_N (A)	P_V (W)	
Nominal data apply for U_n = 400 V							
VSI2.0WSA2-4/0003A	3.8	1.1	2.5	0.75	2.0	33	B
VSI2.0WSA2-4/0004A	6.0	1.5	4.0	1.1	3.2	45	
VSI2.0WSA2-4/0006A	9.0	2.2	6.0	1.5	4.8	66	
VSI2.0WSA2-4/0008A	11.3	3	7.5	2.2	6.0	90	
VSI2.0WSA2-4/0010A	14.3	4	9.5	3	7.6	120	
VSI2.0WSA2-4/0013A	19.5	5.5	13	4	10.4	165	
VSI2.0WSA2-4/0018A	27	7.5	18	5.5	14.4	225	
VSI2.0WSA2-4/0026A	39	11	26	7.5	21	220	C
VSI2.0WSA2-4/0031A	46	15	31	11	25	300	
VSI2.0WSA2-4/0037A	55	18.5	37	15	29.6	370	
VSI2.0WSA2-4/0046A	69	22	46	18.5	37	440	
VSI2.0WSA2-4/0061A	92	30	61	22	49	600	D
VSI2.0WSA2-4/0074A	111	37	74	30	59	740	
VSI2.0WSA2-4/0090A	108	45	90	37	72	900	E
VSI2.0WSA2-4/0109A	131	55	109	45	87	1100	
VSI2.0WSA2-4/0146A	175	75	146	55	117	1500	
VSI2.0WSA2-4/0175A	210	90	175	75	140	1800	
VSI2.0WSA2-4/0210A	252	110	210	90	168	2200	F
VSI2.0WSA2-4/0250A	300	132	250	110	200	2640	
VSI2.0WSA2-4/0295A	354	160	295	132	236	3200	
Nominal data apply for U_n = 525 V							
VSI2.0WSA2-5/0003A	3.8	1.1	2.5	1.1	2.0	33	B
VSI2.0WSA2-5/0004A	6.0	2.2	4.0	1.5	3.2	66	
VSI2.0WSA2-5/0006A	9.0	3	6.0	3	4.8	90	
VSI2.0WSA2-5/0008A	11.3	4	7.5	3	6.0	120	
VSI2.0WSA2-5/0010A	14.3	5.5	9.5	4	7.6	165	
VSI2.0WSA2-5/0013A	19.5	7.5	13	5.5	10.4	225	
VSI2.0WSA2-5/0018A	27	11	18	7.5	14.4	330	
VSI2.0WSA2-5/0026A	39	15	26	15	21	300	C
VSI2.0WSA2-5/0031A	46	18.5	31	15	25	370	
VSI2.0WSA2-5/0037A	55	22	37	18.5	29.6	440	
VSI2.0WSA2-5/0046A	69	30	46	22	37	600	
VSI2.0WSA2-5/0061A	92	37	61	30	49	740	D
VSI2.0WSA2-5/0074A	111	45	74	37	59	900	
VSI2.0WSA2-5/0090A	108	55	90	45	72	1200	F69
VSI2.0WSA2-5/0109A	131	75	109	55	87	1700	
VSI2.0WSA2-5/0146A	175	90	146	75	117	2100	
VSI2.0WSA2-5/0175A	210	110	175	90	140	2600	
VSI2.0WSA2-5/0200A	240	132	200	110	160	3300	
Nominal data apply for U_n = 690 V							
VSI2.0WSA2-6/0090A	108	90	90	75	72	1800	F69
VSI2.0WSA2-6/0109A	131	110	109	90	87	2200	
VSI2.0WSA2-6/0146A	175	132	146	110	117	2640	
VSI2.0WSA2-6/0175A	210	160	175	132	140	3200	
VSI2.0WSA2-6/0200A	240	200	200	160	160	4000	

* Available for a limited time, insofar as the drive temperature permits

Dimensions

Size	Height		Width	Depth	Weight	Cooling air flow	Remarks
	H1 (mm)	H2 (mm)	B (mm)	T (mm)	(kg)	(m^3/h)	
B	350	416	203	200	12,5	75	
C	440	512	178	292	24	120	26 A – 31 A
					24	170	37 A – 46 A
D	545	590	220	295	32	170	
E	950	-	285	314	56	510	90 A – 109 A
					60	510	146 A – 175 A
F	950	-	345	314	74	800	
F69	1090	-	345	314	77	800	

H1 = Housing height; H2 = Overall height including cable connections

VSI2.0 type 2 (HD High Dynamic), cabinet system, IP 21/23/54

Frequency converter	Max. output current*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min. every 10 min)		Power loss for normal duty	Size
Type designation	I_{max}	P_{Motor} (kW)	I_N (A)	P_{Motor} (kW)	I_N (A)	P_V (kW)	**
Nominal data apply for U_n = 400 V							
VSI2.0CSA2-4/0375A	450	200	375	160	300	4	G (2)
VSI2.0CSA2-4/0430A	516	220	430	200	344	4.4	H (2)
VSI2.0CSA2-4/0500A	600	250	500	220	400	5	
VSI2.0CSA2-4/0600A	720	315	600	250	480	6.3	I (3)
VSI2.0CSA2-4/0650A	780	355	650	300	520	7.1	
VSI2.0CSA2-4/0750A	900	400	750	355	600	8	
VSI2.0CSA2-4/0860A	1032	450	860	400	688	9	J (4)
VSI2.0CSA2-4/1000A	1200	560	1000	450	800	11.2	
VSI2.0CSA2-4/1150A	1380	630	1150	500	920	12.6	KA (5)
VSI2.0CSA2-4/1250A	1500	710	1250	560	1000	14.2	
VSI2.0CSA2-4/1350A	1620	710	1350	600	1080	14.2	K (6)
VSI2.0CSA2-4/1500A	1800	800	1500	630	1200	16	
VSI2.0CSA2-4/1750A	2100	900	1750	800	1400	18	L (7)
VSI2.0CSA2-4/2000A	2400	1120	2000	900	1600	22.4	M (8)
VSI2.0CSA2-4/2250A	2700	1250	2250	1000	1800	25	N (9)
VSI2.0CSA2-4/2500A	3000	1400	2500	1120	2000	28	O (10)
Nominal data apply for U_n = 525 V							
VSI2.0CSA2-5/0250A	300	160	250	132	200	4	H69 (2)
VSI2.0CSA2-5/0300A	360	220	300	160	240	5.5	
VSI2.0CSA2-5/0375A	450	250	375	220	300	6.3	
VSI2.0CSA2-5/0400A	480	300	400	220	320	7.5	
VSI2.0CSA2-5/0430A	516	315	430	250	344	8	I69 (3)
VSI2.0CSA2-5/0500A	600	355	500	300	400	9	
VSI2.0CSA2-5/0600A	720	400	600	355	480	10	
VSI2.0CSA2-5/0650A	780	450	650	355	520	11	J69 (4)
VSI2.0CSA2-5/0720A	864	500	720	400	576	13	
VSI2.0CSA2-5/0800A	960	560	800	450	640	14	
VSI2.0CSA2-5/0900A	1080	630	900	500	720	16	KA69 (5)
VSI2.0CSA2-5/1000A	1200	710	1000	560	800	18	
VSI2.0CSA2-5/1200A	1440	900	1200	710	960	23	K69 (6)
VSI2.0CSA2-5/1400A	1680	1000	1400	800	1120	25	L69 (7)
VSI2.0CSA2-5/1600A	1920	1200	1600	900	1280	30	M69 (8)
VSI2.0CSA2-5/1800A	2160	1300	1800	1100	1440	33	N69 (9)
VSI2.0CSA2-5/2000A	2400	1500	2000	1200	1600	38	O69 (10)
VSI2.0CSA2-5/2200A	2640	1600	2200	1300	1760	40	P69 (11)
VSI2.0CSA2-5/2400A	2880	1800	2400	1400	1920	45	Q69 (12)
VSI2.0CSA2-5/2600A	3120	1900	2600	1500	2080	48	R69 (13)
VSI2.0CSA2-5/2800A	3360	2100	2800	1600	2240	53	S69 (14)
VSI2.0CSA2-5/3000A	3600	2200	3000	1800	2400	55	T69 (15)
Nominal data apply for U_n = 690 V							
VSI2.0CSA2-6/0250A	300	250	250	200	200	5	H69 (2)
VSI2.0CSA2-6/0300A	360	315	300	250	240	6.3	
VSI2.0CSA2-6/0375A	450	355	375	300	300	7.1	
VSI2.0CSA2-6/0400A	480	400	400	315	320	8	
VSI2.0CSA2-6/0430A	516	400	430	315	344	8	I69 (3)
VSI2.0CSA2-6/0500A	600	450	500	355	400	9	
VSI2.0CSA2-6/0600A	720	600	600	450	480	12	
VSI2.0CSA2-6/0650A	780	630	650	500	520	12.6	J69 (4)
VSI2.0CSA2-6/0720A	864	710	720	560	576	14.2	
VSI2.0CSA2-6/0800A	960	800	800	630	640	16	
VSI2.0CSA2-6/0900A	1080	900	900	710	720	18	KA69 (5)
VSI2.0CSA2-6/1000A	1200	1000	1000	800	800	20	
VSI2.0CSA2-6/1200A	1440	1200	1200	950	960	24	K69 (6)
VSI2.0CSA2-6/1400A	1680	1400	1400	1120	1120	28	L69 (7)
VSI2.0CSA2-6/1600A	1920	1600	1600	1250	1280	32	M69 (8)
VSI2.0CSA2-6/1800A	2160	1800	1800	1400	1440	36	N69 (9)
VSI2.0CSA2-6/2000A	2400	2000	2000	1600	1600	40	O69 (10)
VSI2.0CSA2-6/2200A	2640	2200	2200	1700	1760	44	P69 (11)
VSI2.0CSA2-6/2400A	2880	2400	2400	1900	1920	48	Q69 (12)

Frequency converter	Max. output current*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min. every 10 min)		Power loss for normal duty	Size
Type designation	I_{max}	P_{Motor} (kW)	I_N (A)	P_{Motor} (kW)	I_N (A)	P_V (kW)	**
VSI2.0CSA2-6/2600A	3120	2600	2600	2100	2080	52	R69 (13)
VSI2.0CSA2-6/2800A	3360	2800	2800	2200	2240	56	S69 (14)
VSI2.0CSA2-6/3000A	3600	3000	3000	2400	2400	60	T69 (15)

* Available for a limited time, insofar as the drive temperature permits

** Figure in brackets, e.g. H (2), indicates the number of parallel power modules (PEBBs, Power Electronic Building Blocks)

Dimensions

Size	Cooling air flow (m^3/h)	Dimensions H = 2250 mm, D = 600 mm Width (mm)		Weight (kg)	
		6-pulse	12-pulse	6-pulse	12-pulse
G	1020	1000	1400	452	Upon request
H	1600	1000	1400	472	Upon request
I	2400	1300	-	617	-
J	3200	1600	2000	790	Upon request
KA	4000	2100	-	931	-
K	4800	2400	2600	1154	Upon request
L	5600	2700	-	1289	-
M	6400	Upon request	3600	Upon request	Upon request
N	7200	Upon request	-	Upon request	-
O	8000	Upon request	4200	Upon request	Upon request
H69	1600	1000	1400	510	620
I69	2400	1300	-	674	-
J69	3200	1600	2000	820	920
KA69	4000	1900	-	1020	-
K69	4800	2400	2600	1264	1323
L69	5600	2700	-	1472	-
M69	6400	3000	3600	1592	1897
N69	7200	Upon request	-	Upon request	-
O69	8000	Upon request	4200	Upon request	2171
P69	8800	Upon request	-	Upon request	-
Q69	9600	Upon request	4800	Upon request	2788
R69	10400	Upon request	-	Upon request	-
S69	11200	Upon request	5600	Upon request	3187
T69	12000	Upon request	-	Upon request	-

VEMoDRIVE VSI2.0 – SD (Standard Dynamic)

General information on the Standard Dynamic series:

- Sound pressure level < 78 dB(A) at a distance of 1 m
- Nominal data applicable at 40 °C ambient temperature
- Type 1 systems (WSA1) possess a DC link reactor as standard (contrary to type 8 systems)
- All cabinet systems are designed with switch-disconnectors (6-pulse) or motor-operated circuit-breakers (12-pulse)

VSI2.0 type 1/8 (SD Standard Dynamic), wall-mounted, IP 20

Frequency converter	Max. output current*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min. every 10 min)		Power loss for normal duty	Size	Remarks
Type designation	I_{max}	P_{Motor} (kW)	I_N (A)	P_{Motor} (kW)	I_N (A)	P_V (W)		
			Nominal data apply for U_n = 400 V					
VSI2.0WSA8-4/0002A	3	0.75	2.5	0.75	2	52.5	A3	Brake chopper integriert Line reactor optional Input power factor: 0.7 – 0.8
VSI2.0WSA8-4/0003A	4.1	1.1	3.4	1.1	2.7	77		
VSI2.0WSA8-4/0004A	4.9	1.5	4.1	1.5	3.3	105		
VSI2.0WSA8-4/0006A	6.7	2.2	5.6	2.2	4.5	154		
VSI2.0WSA8-4/0007A	8.6	3	7.2	2.2	5.8	210		
VSI2.0WSA8-4/0009A	11.4	4	9.5	3	7.6	280		
VSI2.0WSA8-4/0010A	14.4	5.5	12	4	9.6	385		
VSI2.0WSA8-4/0016A	19.2	7.5	16	5.5	12.8	525	B3	
VSI2.0WSA8-4/0023A	27.6	11	23	7.5	18.4	770		
VSI2.0WSA8-4/0031A	37.2	15	31	11	24.8	750	C3	
VSI2.0WSA8-4/0038A	45.6	18.5	38	15	30.4	925		
VSI2.0WSA1-4/0025A	30	11	25	7.5	20	220	C2	Brake chopper optional DC link reactor integrated Input power factor: 0.95 IP 21 optional
VSI2.0WSA1-4/0030A	36	15	30	11	24	300		
VSI2.0WSA1-4/0036A	43	18.5	36	15	29	370		
VSI2.0WSA1-4/0045A	54	22	45	18.5	36	440		
VSI2.0WSA1-4/0058A	72	30	58	22	46	600		
VSI2.0WSA1-4/0072A	86	37	72	30	58	740	D2	
VSI2.0WSA1-4/0088A	106	45	88	37	70	900		
VSI2.0WSA1-4/0105A	127	55	105	45	85	1100		
VSI2.0WSA1-4/0142A	170	75	142	55	114	1500	E2	
VSI2.0WSA1-4/0171A	205	90	171	75	137	1800		
VSI2.0WSA1-4/0205A	246	110	205	90	164	2200	F2	
VSI2.0WSA1-4/0244A	293	132	244	110	195	2640		
VSI2.0WSA1-4/0293A	352	160	293	132	235	3200		

* Available for a limited time, insofar as the drive temperature permits

Dimensions

Size	Height		Width	Depth	Weight	Cooling air flow	Remarks
	H1 (mm)	H2 (mm)	B (mm)	T (mm)	(kg)	(m^3/h)	
A3	220	287	120	169	2.6	39	
B3	255	325	145	179	3.9	89	
C3	335	407	190	187	5	177	
C2	447	536	176	267	17	120	25 A – 30 A
					17	170	36 A – 58 A
D2	545	658	220	291	30	170	
E2	956	956	275	294	53	510	
F2	956	956	335	294	68	800	

H1 = Housing height; H2 = Overall height including cable connections

VSI2.0 type 1 (SD Standard Dynamic), wall-mounted, IP 54

Frequency converter	Max. output current*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min. every 10 min)		Power loss for normal duty	Size
Type designation	I_{max}	P_{Motor} (kW)	I_N (A)	P_{Motor} (kW)	I_N (A)	P_V (W)	
Nominal data apply for U_n = 400 V							
VSI2.0WSA1-4/0003A	3.0	1.1	2.5	0.75	2.0	33	B
VSI2.0WSA1-4/0004A	4.8	1.5	4.0	1.1	3.2	45	
VSI2.0WSA1-4/0006A	7.2	2.2	6.0	2.2	4.8	66	
VSI2.0WSA1-4/0008A	9.0	3	7.5	2.2	6.0	90	
VSI2.0WSA1-4/0010A	11.4	4	9.5	3	7.6	120	
VSI2.0WSA1-4/0013A	15.6	5.5	13	4	10.4	165	
VSI2.0WSA1-4/0018A	21.6	7.5	18	7.5	14.4	225	
VSI2.0WSA1-4/0026A	31	11	26	11	21	220	C
VSI2.0WSA1-4/0031A	37	15	31	11	25	300	
VSI2.0WSA1-4/0037A	44	18.5	37	15	29.6	370	
VSI2.0WSA1-4/0046A	55	22	46	18.5	37	440	
VSI2.0WSA1-4/0061A	73	30	61	22	49	600	D
VSI2.0WSA1-4/0074A	89	37	74	30	59	740	
VSI2.0WSA1-4/0090A	108	45	90	37	72	900	E
VSI2.0WSA1-4/0109A	131	55	109	45	87	1100	
VSI2.0WSA1-4/0146A	175	75	146	55	117	1500	
VSI2.0WSA1-4/0175A	210	90	175	75	140	1800	
VSI2.0WSA1-4/0210A	252	110	210	90	168	2200	F
VSI2.0WSA1-4/0250A	300	132	250	110	200	2640	
VSI2.0WSA1-4/0295A	354	160	295	132	236	3200	
Nominal data apply for U_n = 525 V							
VSI2.0WSA1-5/0003A	3.0	1.1	2.5	1.1	2.0	33	B
VSI2.0WSA1-5/0004A	4.8	2.2	4.0	1.5	3.2	66	
VSI2.0WSA1-5/0006A	7.2	3	6.0	3	4.8	90	
VSI2.0WSA1-5/0008A	9.0	4	7.5	3	6.0	120	
VSI2.0WSA1-5/0010A	11.4	5.5	9.5	4	7.6	165	
VSI2.0WSA1-5/0013A	15.6	7.5	13	5.5	10.4	225	
VSI2.0WSA1-5/0018A	21.6	11	18	7.5	14.4	330	
VSI2.0WSA1-5/0026A	31	15	26	15	21	300	C
VSI2.0WSA1-5/0031A	37	18.5	31	18.5	25	370	
VSI2.0WSA1-5/0037A	44	22	37	18.5	29.6	440	
VSI2.0WSA1-5/0046A	55	30	46	22	37	600	
VSI2.0WSA1-5/0061A	73	37	61	30	49	740	D
VSI2.0WSA1-5/0074A	89	45	74	37	59	900	
VSI2.0WSA1-5/0090A	108	55	90	45	72	1200	F69
VSI2.0WSA1-5/0109A	131	75	109	55	87	1700	
VSI2.0WSA1-5/0146A	175	90	146	75	117	2100	
VSI2.0WSA1-5/0175A	210	110	175	90	140	2600	
VSI2.0WSA1-5/0200A	240	132	200	110	160	3300	
Nominal data apply for U_n = 690 V							
VSI2.0WSA1-6/0090A	108	90	90	75	72	1800	F69
VSI2.0WSA1-6/0109A	131	110	109	90	87	2200	
VSI2.0WSA1-6/0146A	175	132	146	110	117	2640	
VSI2.0WSA1-6/0175A	210	160	175	132	140	3200	
VSI2.0WSA1-6/0200A	240	200	200	160	160	4000	

* Available for a limited time, insofar as the drive temperature permits

Dimensions

Size	Height		Width	Depth	Weight	Cooling air flow	Remarks
	H1 (mm)	H2 (mm)	B (mm)	T (mm)	(kg)	(m^3/h)	
B	350	416	203	200	12,5	75	
C	440	512	178	292	24	120	26 A – 31 A
					24	170	37 A – 46 A
D	545	590	220	295	32	170	
E	950	-	285	314	56	510	90 A – 109 A
					60	510	146 A – 175 A
F	950	-	345	314	74	800	
F69	1090	-	345	314	77	800	

H1 = Housing height; H2 = Overall height including cable connections

VSI2.0 type 1 (SD Standard Dynamic), cabinet system, IP 21/23/54

Frequency converter	Max. output current*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min. every 10 min)		Power loss for normal duty	Size
Type designation	I_{max}	P_{Motor} (kW)	I_N (A)	P_{Motor} (kW)	I_N (A)	P_V (kW)	**
Nominal data apply for U_n = 400 V							
VSI2.0CSA1-4/0375A	450	200	375	160	300	4	G (2)
VSI2.0CSA1-4/0430A	516	220	430	200	344	5	H (2)
VSI2.0CSA1-4/0500A	600	250	500	220	400	6	
VSI2.0CSA1-4/0600A	720	315	600	250	480	6.3	I (3)
VSI2.0CSA1-4/0650A	780	355	650	300	520	7.1	
VSI2.0CSA1-4/0750A	900	400	750	355	600	8	
VSI2.0CSA1-4/0860A	1032	450	860	400	688	9	J (4)
VSI2.0CSA1-4/1000A	1200	560	1000	450	800	11.2	
VSI2.0CSA1-4/1150A	1380	630	1150	500	920	12.6	KA (5)
VSI2.0CSA1-4/1250A	1500	710	1250	560	1000	14.2	
VSI2.0CSA1-4/1350A	1620	800	1350	600	1080	16	K (6)
VSI2.0CSA1-4/1500A	1800	900	1500	710	1200	18	
VSI2.0CSA1-4/1750A	2100	1000	1750	800	1400	20	L (7)
VSI2.0CSA1-4/2000A	2400	1120	2000	900	1600	22.4	M (8)
VSI2.0CSA1-4/2250A	2700	1250	2250	1000	1800	25	N (9)
VSI2.0CSA1-4/2500A	3000	1400	2500	1120	2000	28	O (10)
Nominal data apply for U_n = 525 V							
VSI2.0CSA1-5/0250A	300	160	250	132	200	4	H69 (2)
VSI2.0CSA1-5/0300A	360	220	300	160	240	5.5	
VSI2.0CSA1-5/0375A	450	250	375	220	300	6.3	
VSI2.0CSA1-5/0400A	480	300	400	250	320	7.5	
VSI2.0CSA1-5/0430A	516	315	430	250	344	8	I69 (3)
VSI2.0CSA1-5/0500A	600	350	500	300	400	9	
VSI2.0CSA1-5/0600A	720	450	600	355	480	11	
VSI2.0CSA1-5/0650A	780	450	650	355	520	11	J69 (4)
VSI2.0CSA1-5/0720A	864	500	720	400	576	13	
VSI2.0CSA1-5/0800A	960	560	800	450	640	14	
VSI2.0CSA1-5/0900A	1080	680	900	550	720	17	KA69 (5)
VSI2.0CSA1-5/1000A	1200	750	1000	600	800	19	
VSI2.0CSA1-5/1200A	1440	900	1200	710	960	23	K69 (6)
VSI2.0CSA1-5/1400A	1680	1050	1400	850	1120	26	L69 (7)
VSI2.0CSA1-5/1600A	1920	1200	1600	1000	1280	30	M69 (8)
VSI2.0CSA1-5/1800A	2160	1400	1800	1100	1440	35	N69 (9)
VSI2.0CSA1-5/2000A	2400	1500	2000	1200	1600	38	O69 (10)
VSI2.0CSA1-5/2200A	2640	1700	2200	1300	1760	43	P69 (11)
VSI2.0CSA1-5/2400A	2880	1800	2400	1450	1920	45	Q69 (12)
VSI2.0CSA1-5/2600A	3120	2000	2600	1600	2080	50	R69 (13)
VSI2.0CSA1-5/2800A	3360	2100	2800	1700	2240	53	S69 (14)
VSI2.0CSA1-5/3000A	3600	2300	3000	1800	2400	58	T69 (15)
Nominal data apply for U_n = 690 V							
VSI2.0CSA1-6/0250A	300	250	250	200	200	5	H69 (2)
VSI2.0CSA1-6/0300A	360	315	300	250	240	6.3	
VSI2.0CSA1-6/0375A	450	355	375	300	300	7.1	
VSI2.0CSA1-6/0400A	480	400	400	315	320	8	
VSI2.0CSA1-6/0430A	516	450	430	315	344	9	I69 (3)
VSI2.0CSA1-6/0500A	600	500	500	355	400	10	
VSI2.0CSA1-6/0600A	720	600	600	450	480	12	
VSI2.0CSA1-6/0650A	780	630	650	500	520	12.6	J69 (4)
VSI2.0CSA1-6/0720A	864	710	720	560	576	14.2	
VSI2.0CSA1-6/0800A	960	800	800	630	640	16	
VSI2.0CSA1-6/0900A	1080	900	900	710	720	18	KA69 (5)
VSI2.0CSA1-6/1000A	1200	1000	1000	800	800	20	
VSI2.0CSA1-6/1200A	1440	1200	1200	950	960	24	K69 (6)
VSI2.0CSA1-6/1400A	1680	1400	1400	1120	1120	28	L69 (7)
VSI2.0CSA1-6/1600A	1920	1600	1600	1250	1280	32	M69 (8)
VSI2.0CSA1-6/1800A	2160	1800	1800	1400	1440	36	N69 (9)
VSI2.0CSA1-6/2000A	2400	2000	2000	1600	1600	40	O69 (10)
VSI2.0CSA1-6/2200A	2640	2200	2200	1700	1760	44	P69 (11)
VSI2.0CSA1-6/2400A	2880	2400	2400	1900	1920	48	Q69 (12)

Frequency converter	Max. output current*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min. every 10 min)		Power loss for normal duty	Size
Type designation	I_{max}	P_{Motor} (kW)	I_N (A)	P_{Motor} (kW)	I_N (A)	P_V (kW)	**
VSI2.0CSA1-6/2600A	3120	2600	2600	2100	2080	52	R69 (13)
VSI2.0CSA1-6/2800A	3360	2800	2800	2200	2240	56	S69 (14)
VSI2.0CSA1-6/3000A	3600	3000	3000	2400	2400	60	T69 (15)

* Available for a limited time, insofar as the drive temperature permits

** Figure in brackets, e.g. H (2), indicates the number of parallel power modules (PEBBs, Power Electronic Building Blocks)

Dimensions

Size	Cooling air flow (m^3/h)	Dimensions H = 2250 mm, D = 600 mm Width (mm)		Weight (kg)	
		6-pulse	12-pulse	6-pulse	12-pulse
G	1020	1000	1400	452	Upon request
H	1600	1000	1400	472	Upon request
I	2400	1300	-	617	-
J	3200	1600	2000	790	Upon request
KA	4000	2100	-	931	-
K	4800	2400	2600	1154	Upon request
L	5600	2700	-	1289	-
M	6400	Upon request	3600	Upon request	Upon request
N	7200	Upon request	-	Upon request	-
O	8000	Upon request	4200	Upon request	Upon request
H69	1600	1000	1400	510	620
I69	2400	1300	-	674	-
J69	3200	1600	2000	820	920
KA69	4000	1900	-	1020	-
K69	4800	2400	2600	1264	1323
L69	5600	2700	-	1472	-
M69	6400	3000	3600	1592	1897
N69	7200	Upon request	-	Upon request	-
O69	8000	Upon request	4200	Upon request	2171
P69	8800	Upon request	-	Upon request	-
Q69	9600	Upon request	4800	Upon request	2788
R69	10400	Upon request	-	Upon request	-
S69	11200	Upon request	5600	Upon request	3187
T69	12000	Upon request	-	Upon request	-

VEMoDRIVE VSI2.0 – LH/RP (Low Harmonic / Regenerative Power)

General information on the LH/RP series:

- Sound pressure level < 78 dB(A) at a distance of 1 m
- All systems display a very low THDi < 5%
- Nominal data applicable at 40 °C ambient temperature
- Installation in IP 54 cabinet with switch-disconnector, mains contactor, LCL filter and output reactor as standard

VSI2.0-LH/RP (Low Harmonic / Regenerative Power), cabinet system, IP 54

Frequency converter Type designation** VSI2.0CLH1- VSI2.0CLH2- VSI2.0CRP1- VSI2.0CRP2-	Max. output current*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min. every 10 min)		Power loss for normal duty	Sizes	Dimensions H = 2250 mm D = 600 mm	Weight	Cooling air flow
	I_{max}	P_{Motor} (kW)	I_N (A)	P_{Motor} (kW)	I_N (A)	P_V (kW)	***	Width (mm)	(kg)	(m^3/h)
Nominal data apply for U_n = 400 V										
4/0109A	131	55	109	45	87	1.7	E46+E	800	380	1020
4/0146A	175	75	146	55	117	2.3	E46+E	800	400	1020
4/0175A	210	90	175	75	140	2.7	E46+E	900	480	1020
4/0210A	252	110	210	90	168	3.3	F46+F	900	500	1600
4/0250A	300	132	250	110	200	4	F46+F	900	500	1600
4/0300A	360	160	300	132	240	4.8	F46+G	1300	700	1820
4/0375A	450	200	375	160	300	6	G46+G	1500	750	2040
4/0430A	516	220	430	200	344	6.6	G46+H	1500	830	2620
4/0500A	600	250	500	220	400	7.5	H46+H	1500	880	3200
4/0600A	720	315	600	250	480	9.5	H46+I	1900	1040	4000
4/0650A	780	355	650	315	520	10.7	I46+I	2200	1210	4800
4/0750A	900	400	750	355	600	12	I46+I	2200	1210	4800
4/0860A	1032	450	860	400	688	13.5	I46+J	2500	1370	5600
4/1000A	1200	560	1000	450	800	16.8	J46+J	3000	1600	6400
4/1200A	1440	630	1200	500	960	18.9	J46+KA	3300	1700	7200
4/1500A	1800	800	1500	630	1200	24	K46+K	4500	2250	9600
4/1750A	2100	900	1750	800	1400	27	K46+L	Upon request		10400
Nominal data apply for U_n = 690 V										
6/0109A	131	110	109	90	87	3.3	F69+F69	800	410	1600
6/0146A	175	132	146	110	117	4	F69+F69	800	430	1600
6/0185A	222	160	185	132	148	4.8	F69+F69	900	540	1600
6/0250A	300	250	250	200	200	7.5	H69+H69	1800	870	3200
6/0300A	360	315	300	250	240	9.5	H69+H69	1800	870	3200
6/0375A	450	355	375	315	300	10.7	H69+H69	1800	910	3200
6/0430A	516	450	430	355	344	13.5	I69+I69	2800	1350	4800
6/0560A	672	560	560	450	448	16.8	I69+I69	2800	1390	4800
6/0750A	900	710	750	600	600	21.3	I69+J69	Upon request		5600
6/1000A	1200	1000	1000	800	800	30	K69+KA69	Upon request		8800
6/1120A	1344	1100	1120	900	896	33	K69+K69	Upon request		9600

* Available for a limited time, insofar as the drive temperature permits

** Data are applicable for VSC2.0CLH1 (Low Harmonic, Standard Dynamic), VSC2.0CLH2 (Low Harmonic, High Dynamic), VSC2.0CRP1 (Regenerative Power, Standard Dynamic), VSC2.0CRP2 (Regenerative Power, High Dynamic).

*** Sizes refer to the regenerative power supply units and frequency converters installed in the cabinet

General data

Electrical parameters

Mains voltage **	VSI2.0xSxx-4 VSI2.0xSxx-5 VSI2.0xSxx-6 VSI2.0CLHx-4/VSI2.0CRPx-4 VSI2.0CLHx-6/VSI2.0CRPx-6	230 – 480 V +10%/-15% (10% at 230 V) 400 – 525 V +10%/-15% 400 – 690 V +10%/-15% 380 – 460 V +10%/-15% 480 – 690 V +10%/-15%
Mains frequency	VSI2.0xSx VSI2.0CLH/VSI2.0CRP	45 to 65 Hz 48 – 52 Hz and 58 – 62 Hz
Mains type	Earthed, asymmetrically earthed and isolated power supply (TN and IT systems)	
Overall input power factor	VSI2.0xSx VSI2.0CLH/VSI2.0CRP	0.95 for type 1/2 0.7 – 0.8 for type 8/9 1.0
Output voltage	VSI2.0xSx VSI2.0CLH/VSI2.0CRP	(0 – 1) x mains voltage (0 – 1.2) x mains voltage
Output frequency	0 – 400 Hz	
Output switching frequency	3 kHz (for U/f control; setting range 1.5 – 6 kHz)	
Efficiency at nominal load	97% for type 1/2 size B 98% for type 1/2 size C – T and C2–F2 93% for type 8/9 size A3 – B3 95% for type 8/9 size C3 97% for VSI2.0CLH/VSI2.0CRP	
Degree of protection	IP 20, IP 21, IP 23, IP 54	

** Nominal voltage of the converter, as parameterised

Ambient conditions for normal operation

Normal ambient temperature	0 °C to +40 °C; higher temperatures with corresponding derating (see below)
Atmospheric pressure	86 – 106 kPa
Relative humidity (to IEC 60721-3-3)	Class 3K4, 5 to 95% non-condensing
Contamination (to IEC 60721-3-3)	– Electrically conducting dust is not permissible; cooling air must be clean and free of corrosive substances – Chemical gases: class 3C2 (coated circuit boards 3C3); solid particles: class 3S2.
Vibration	In accordance with IEC 60068-2-6, sinusoidal vibration: 10 < f < 57 Hz, 0.075 mm 57 < f < 150 Hz, 1 g Sizes B to D2: IEC 60721-3-3 3M4; 2–9 Hz, 3.0 mm and 9–20 Hz, 1 g (10 m/s^2)
Height	0 – 1000 m, higher altitudes with corresponding derating (see below)

Derating

Operation at higher temperatures:
VEMoDRIVE frequency converters are designed for operation at ambient temperatures up to max. 40 °C. It is necessary to reduce the output current for operation at temperatures above 40 °C.

VSI2.0xSx:
Output reduction by 1%/°C (max. 55 °C for type 1/2, max. 50 °C for type 8/9)

VSI2.0CLH/VSI2.0CRP:
Output reduction by 2.5%/°C (max. 45 °C)

Installation altitude
- 480 V frequency converter with reduction of nominal current by 1% per 100 m up to an altitude of 4000 m
- 690 V frequency converter with reduction of nominal current by 1% per 100 m up to an altitude of 2000 m
- Coated circuit boards required for altitudes from 2000 to 4 000 m

Storage conditions

Temperature	-20 to +60 °C
Atmospheric pressure	86 to 106 kPa
Relative humidity	Class 1K4, max. 95%, non-condensing and no icing

Product conformity

CE certification	All sizes
UL certification / cULus certification	All sizes up to and including 1000 A / 480 V and 1500 A / 480 V (type 1/2 only)
Certification for marine sector	DNV (type 1/2 only)
EAC	All sizes

Standards and regulations

Europe

EMC Directive	2004/108/EG
Low Voltage Directive	2006/95/EG
WEEE Directive	2002/96/EG

General applicability

EN 60204-1	– Safety of machinery – Electrical equipment of machines, – Part 1: General requirements
EN(IEC)61800-3:2004	– Adjustable-speed electrical power drive systems – Part 3: EMC requirements and specific test methods. – EMC Directive: Declaration of conformity and CE marking
EN(IEC)61800-5-1 Ed. 2.0	– Adjustable speed electrical power drive systems, Part 5-1: Safety requirements - Electrical, thermal and energy – Low Voltage Directive: Declaration of conformity and CE marking

North and South America

USL	– USL (United States Standards listed) in accordance with the stipulations of UL508C – Power conversion equipment
UL 840	– UL safety standard for power conversion equipment: Insulation coordination including clearances and creepage distances for electrical equipment
CNL	– CNL (Canadian National Standards listed) in accordance with the stipulations of CAN/CSA C22.2 No. 14-10 – Industrial control equipment

Russia

EAC (formerly GOST R)	For all sizes

Design versions

The dimensions for the individual sizes shown can be found on pages 14 and 16.

Size B
IP 54

Size C
IP 54

Size D
IP 54

Size E
IP 54

Size F
IP 54

Size G
IP 54

The dimensions for the individual sizes shown can be found on page 13.

Size A3
IP 20

Size B3
IP 20

Size C3
IP 20

Size C2
IP 20

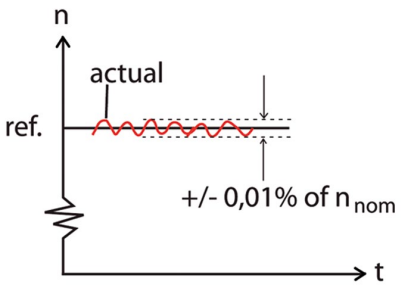
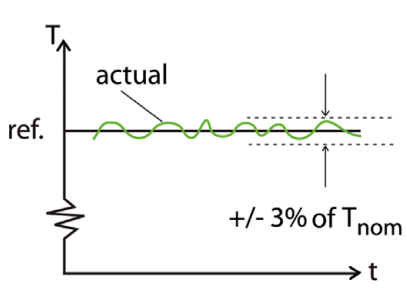
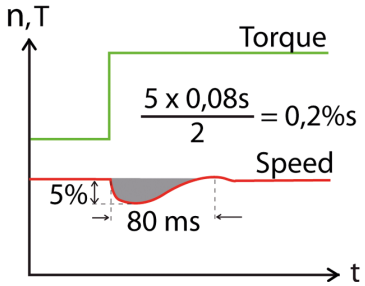
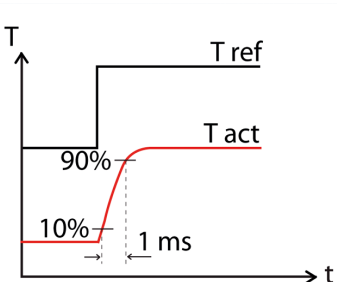
Size D2
IP 21

Size E2
IP 20

Size F2
IP 20

Control precision of VEMoDRIVE VSI2.0-HD (High Dynamic)

The following specifications apply for direct torque control. For closed-loop control, an encoder/tacho is required.
With open-loop control, the speed is calculated without encoder from a motor model.

Speed control	Torque control
Static accuracy (linearity)	Static accuracy (linearity)
	
Closed-loop control * = 0.01% Open-loop control * = 0.1% * Percentage values refer to the nominal speed	Closed-loop control *: < 3% Open-loop control *: < 3% at 10–100% of nominal speed < 10% at 0–10% of nominal speed * Percentage values refer to the nominal torque
Dynamic accuracy (speed dip for load step from 0 to 100%)	Dynamic accuracy (load step from 0 to 100%)
	
Closed-loop control = 0.2% s (100% load step) Open-loop control = 0.4% s (100% load step)	Closed-loop and open-loop control: Torque rise time = 1 ms

Control precision of VEMoDRIVE VSI2.0-SD (Standard Dynamic)

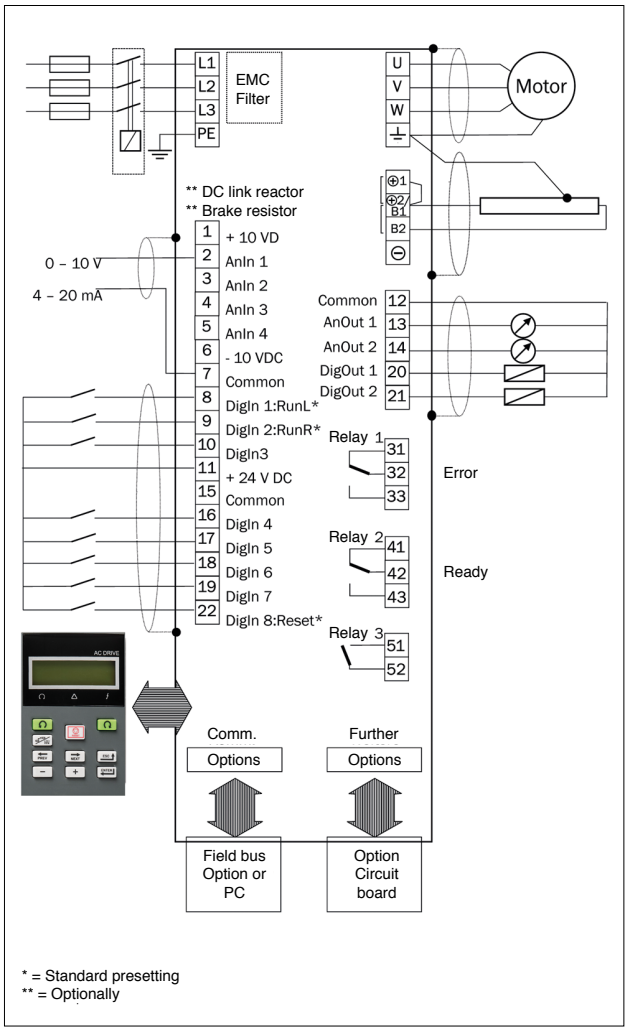
The following specifications apply for U/f control.

Speed control	Torque control
Accuracy of speed control = approx. 1% of nominal speed (slip frequency)	Accuracy of torque = approx. 5% of nominal torque (20–100% speed)

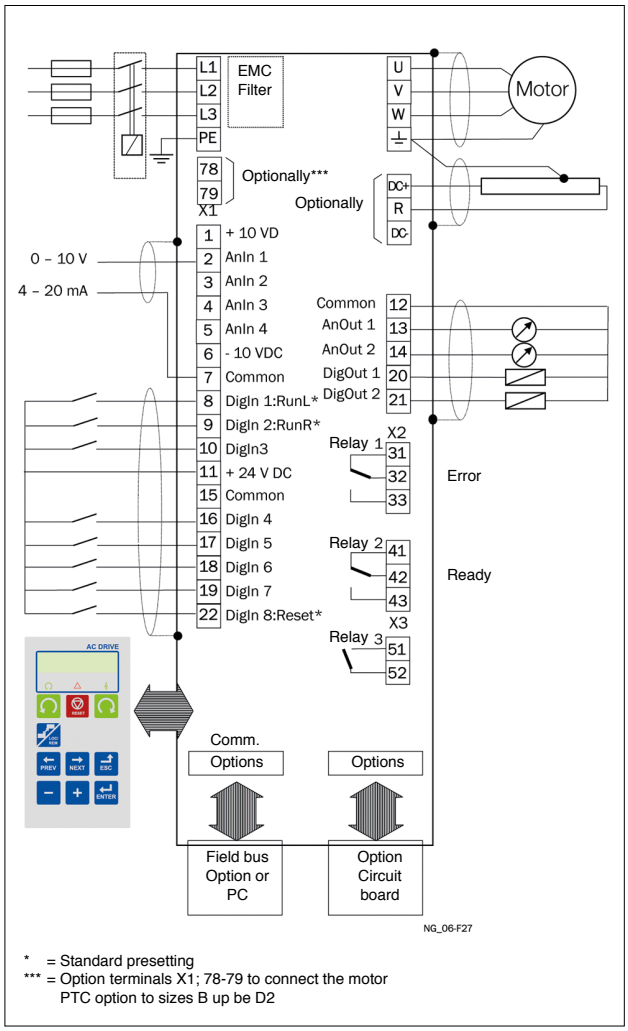
Interfaces

Overview

Type 8/9



Type 1/2



X1	Name	Function (default setting)
1	+10 V	+10 V DC supply voltage
2	AnIn1	Set speed
3	AnIn2	Not used
4	AnIn3	Not used
5	AnIn4	Not used
6	-10 V	-10 V DC supply voltage
7	Common	Signal earth
8	DigIn 1	RunL
9	DigIn 2	RunR
10	DigIn 3	Not used
11	+24 V	+24 V DC supply voltage
12	Common	Signal earth
13	AnOut 1	Min. speed to max. speed
14	AnOut 2	0 to max. torque
15	Common	Signal earth
16	DigIn 4	Not used
17	DigIn 5	Not used
18	DigIn 6	Not used
19	DigIn 7	Not used

X1	Name	Function (default setting)
20	DigOut 1	Ready
21	DigOut 2	Brake/no error
22	DigIn 8	Reset

X2	Name	Function (default setting)
31	N/C 1	Relay 1 output = Error Energised when the frequency converter is in ERROR state. N/C is opened when the relay is energised (applies for all relays) N/O is closed when the relay is energised (applies for all relays)
32	COM 1	
33	N/O 1	
41	N/C 2	Relay 2 output = Ready Energised when the converter is ready to start
42	COM 2	
43	N/O 2	

X3	Name	Function (default setting)
51	COM 3	Relay 3 output = Not used
52	N/O 3	

All inputs and outputs are programmable.

Parameters of input and output channels

Inputs, control signals

Analog (differential), 4 channels	
Analog voltage/current	0 – ±10 V; 0 – 20 mA via switch
Max. input voltage	+ 30 V
Input impedance	20 kΩ (voltage), 250 Ω (current)
Resolution	12 bits (11 bits + sign)
Hardware precision	0.5% of measuring range + 1.5 LSB*
Non-linearity	1.5 LSB*

Digital, 8 channels	
Eingangsspannung	High: > 9 V_{DC} ; low: < 4 V_{DC}
Max. input voltage	+ 30 V_{DC}
Input impedance	< 3,3 V_{DC}: 4,7 kΩ ; ≥ 3,3 V_{DC}: 3,6 kΩ
Signal delay	≤ 8 ms

Outputs, control signals

Analog, 2 channels	
Output voltage/current	0 – 10 V; 0 – 20 mA via software setting
Max. Output voltage	+ 15 V at 5 mA
Short-circuit current (t → ∞)	+ 15 mA (voltage); 140 mA (current)
Output impedance	10 Ω (voltage)
Resolution	10 Bit
Max. load impedance for current	500 Ω
Hardware precision	1.9% of measuring range (voltage), 2.4% of measuring range (current)
Offset	3 LSB*
Non-linearity	2 LSB*

Relay outputs, 3 outputs	
Current, voltage	0.1 – 2 A, max. 250 V_{AC} or 42 V_{DC}

Voltage outputs	
+ 10 V_{DC}	+ 10 V_{DC} at 10 mA (max. short-circuit current 30 mA)
- 10 V_{DC}	- 10 V_{DC} at 10 mA
+ 24 V_{DC}	+ 24 V_{DC} (max. short-circuit current 100 mA, together with digital outputs)

* LSB = Least significant bit

Digital, 2 channels	
Output voltage	High > 20 V_{DC} at 50 mA, > 23 V_{DC} open Low < 1 V_{DC} at 50 mA
Short-circuit current (∞)	100 mA max. (together with + 24 V_{DC})

Options for the frequency converter VSI2.0

Overview

Option	Type 8/9	Type 1/2
No. of possible option boards	max. 2 function boards + 1 communication board	max. 3 function boards + 1 communication board
Coated circuit boards	Standard	Standard for sizes C2 – F2 Optional for all other sizes
Function boards		
I/O-Board	X	X (also several possible)
Encoder-Board	X	X
PTC/PT100-Board	-	X
PTC input	X	X* (no board slot occupied, optional for sizes B – D, standard for C2 – F2)
CRIO board	-	X (for HD High Dynamic only)
Standby-Spannungsversorgung	X	X*
STO	X	X* (no board slot occupied for size E/E2 and larger)
Communication boards		
Profibus DP	X	X
DeviceNet	X	X
Modbus TCP	X	X
Modbus TCP M12	X	X
RS232/485 (Modbus RTU)	X	X
EtherCAT®	X	X
Profinet IO 1-Port	X	X
Profinet IO 2-Port	X	X
Ethernet IP 2-Port	X	X
Filters		
EMC filter, category C2	-	X*
Output reactor	X	X (standard for 690 V, for VSI2.0CLH and VSI2.0CRP)
Overvoltage feedback	X	X (standard for 690 V)
Sine-wave filter	X (type 8 only)	X (type 1 only)
Common mode filter	X	X
Control panels		
Control panel for cabinet door	-	X (standard for cabinet systems)
Hand-held control panel HCP 2.0	-	X
VEMoSoftCom + USB/RS232-Kit	X	X
Further options		
EMV-glands	-	X (sizes B – D)
Brake chopper	Standard	X*
Connection DC +/-	Standard	X* (standard for 690 V)
Crane interface	-	X (for HD: 230 V_{AC} or 24 V_{AC})
Braking resistors	X	X
Liquid cooling	-	X (from $I_N \geq 90$ A)
Link reactor	X	Standard
Circuit-breaker instead of switch disconnector	-	X* (for all cabinet systems)
12-pulse version	-	X* (for cabinet systems with even number of PEBBs, incl. circuit-breaker)

X = Option available; please specify when ordering
* These options are factory-installed

Function boards

Coated circuit boards	– All boards can be supplied in coated versions. Recommended for applications subject to difficult climatic conditions, such as tropical, salty or very dusty environments, high humidity and altitudes over 2000 m. (IEC 60721-3-3, gas class 3C3, solid particles 3S2)
I/O-Board	– 3 additional relay outputs (230 V_{AC}, 5 A, NO/NC: Normally Open/Closed). Ideal for the control of several pump or fan drives. – 3 additional differential digital inputs (24 V; 3.2 kΩ; AC/DC), programmable. Inputs provide for insulation of 50 V (AC/DC) between the channels. – Max. 3 I/O boards can be installed per frequency converter.
Encoder-Board	– Input suitable for 5V- (TTL) or 24V- (HTL) incremental encoder. – Resolution: 5 to 16,384 pulses/revolution (min. 9 kΩ, max. frequency = 100 kHz) – For single-ended (A/B) and differential encoders (A/B, A'/B') – Selectable encoder supply voltage 5 V_{DC} or 24 V_{DC}.
PTC/PT100-Board	– 1 isolated PTC input (in accordance with DIN 44081/44082): max. 6 PTC thermistors can be connected in series – 3 PT100 inputs for 2/3/4-conductor cables (in accordance with EN 60751)
PTC input	– 1 isolated PTC input (in accordance with DIN 44081/44082): max. 6 PTC thermistors can be connected in series – Select the PTC/PT100 option if additional inputs are required.
CRIO board (High Dynamic)	– Crane option board to control hoist or travel motions. – Inputs for joystick control supporting 4-step, motor potentiometer or analog reference joystick types. – Inputs for slow down and end limit switches. – All 12 digital inputs 24 V_{DC} (5 kΩ , 8 – 24 V_{DC}). – 2 relay outputs 250 V_{AC} (2 A) for protection of the mechanical brake and for protection in case of load deviations. – Enables high lifting speeds by making use of field weakening.
Standby power supply	– Connection to an external 24 V (AC / DC) power supply to maintain a supply to the control (control board, control panel, communication) in case of main supply shutdown.
STO (Safe Torque Off)	– The additionally integrated inputs and outputs for the auxiliary circuits (STO) comply with the standards EN-IEC 62061:2005 SIL3 and EN-ISO 13849-1:2006. With this option, it is possible to realise stop category 0 in SIL3 or PL e; stop categories 1 and 2 can be realised in conjunction with an additional safety relay.

Communication boards: Field bus and Ethernet

Typical frequency converter response time = 10 ms (excluding possible Ethernet delays).

Profibus DP	– Field bus option module for Profibus DP or DP V1 communication; 9-pin D-sub connector. – Baud rates: 9.6 kbits/s to 12 Mbits/s
DeviceNet	– Field bus option module for DeviceNet communication. – Baud rates: 125 – 500 kbit/s
Modbus/TCP	– Industrial Ethernet option module for the Modbus/TCP protocol; RJ45 connector. – Baud rates: 125 to 500 kbits/s
Modbus/TCP M12	– Industrial Ethernet option module for the Modbus/TCP protocol; M12 connector. – Baud rates: 10 or 100 Mbits/s
RS232/RS485 (Modbus RTU)	– Isolated RS232/RS485 serial communication board for the Modbus/RTU communication protocol. – Baud rates: 2400 to 38400 bits/s.
Profinet IO 1-Port	– Industrial Ethernet option module for the Profinet IO (RT) protocol; RJ45 connector. – Baud rate: 100 Mbits/s
Profinet IO 2-Port	– Industrial Ethernet option module for the Profinet IO (RT) protocol; 2 x RJ45 connector. – Baud rate: 100 Mbits/s
EtherCAT®	– Industrial Ethernet option module for the EtherCAT protocol – 2 x RJ45 connector (IN and OUT). – Baud rate: 100 Mbits/s
EtherNet IP 2-Port	– Industrial Ethernet option module for the Ethernet IP protocol; 1 x RJ45 connector. – Baud rate: 100 Mbits/s

Filters

Selection matrix

Phenomenon	Common mode filters	Output reactors	Output reactors and overvoltage feedback	Sine-wave filter	All-pole sine-wave filter
Common mode currents	Effective	Limited effectiveness	Limited effectiveness	Effective	Very effective
Bearing currents	Effective	-	-	-	Very effective
Voltage peaks U-V-W	-	Limited effectiveness	Very effective	Very effective	Very effective
Voltage peaks U-PE	-	Limited effectiveness	Effective	Limited effectiveness	Very effective
dU/dt	-	Effective	Effective	Very effective	Very effective
Minimisation of motor noise	-	Limited effectiveness	Limited effectiveness	Effective	Effective
EMC: Conducted emissions	Limited effectiveness	Limited effectiveness	Limited effectiveness	Effective	Very effective

Recommendations for different mains voltages up to and including 480 V

Situation	Common mode filters	Output reactors	Output reactors and overvoltage feedback	Sine-wave filter	All-pole sine-wave filter
Unrated, sensitive or unfavourably positioned motors	X	-	-	X	-
Motor in size > 280	X	-	-	-	-
IEC 60034-17 motor	-	X	-	-	-
IEC 60034-25 curve A motor					
Cable lengths** 100 – 200 m	-	X	-	-	-
Cable lengths** 200 – 500 m	-	-	-	-	X
Dynamic use with frequently raised DC voltage (braking)	-	-	X	-	-
Cable without shielding *	-	-	-	-	X

Recommendations for different mains voltages from 500 to 690 V

Situation	Common mode filters	Output reactors	Output reactors and overvoltage feedback	Sine-wave filter	All-pole sine-wave filter
Unrated, sensitive or unfavourably positioned motors	X	-	-	X	-
Motor in size > 280	X	-	-	-	-
3 kV insulation windings					
IEC 60034-25 curve A motor					
Cable lengths** 100 – 200 m	-	-	X	-	-
Cable lengths** 200 – 500 m	-	-	-	X	-
Dynamic utilisation with frequently increased DC voltage (braking)	-	-	X	-	-
Cable without shielding*	-	-	-	-	X

X = Recommended solution for this installation configuration
* Conducted interference limits for motors without shielding – Cables in accordance with EN 61800-3, Table 16
** No precautionary measures are necessary for cable lengths up to 100 m.

Remarks

The tables are based on EMC-compliant cabling with shielded cables and proper EMC installation. The voltage drop in the complete system must not exceed 10% of the supply voltage.
Sine-wave filters are only used in conjunction with VSI2.0-SD (Standard Dynamic).

Enhanced EMC category C2

Note: EMC filters conforming to the specifications for category C3 (second environment) are integrated on the input side of all VSI2.0 converters as standard. EMC filters in accordance with EN 61800-3:2004 category C2 (first environment) are available as options.

Technical data:
– Factory-mounted internal module for sizes B to D2
– Separate module from size E (90 – 700 A); selection according to the table below
– Nominal voltage U_N = 480 V, 50/60 Hz
– IP 20 = Screw terminal (protected)
– IP 00 = Busbar terminals
– Max. 40 °C ambient temperature

Type designation	Converter nominal current (A)	Dimensions H x W x D (mm)	Weight (kg)	Degree of protection
3F480-100.230	90 – 100	325 x 150 x 107	7.1	IP 20
3F480-125.230	100 – 125	345 x 175 x 127	10	IP 20
3F480-150.230	125 – 150	375 x 175 x 135	10	IP 20
3F480-180.230	150 – 180	490 x 170 x 158	13.5	IP 00
3F480-220.230	180 – 220	490 x 170 x 158	13.5	IP 00
3F480-250.230	220 – 250	490 x 230 x 158	18.2	IP 00
3F480300.230	250 – 300	490 x 230 x 158	18.2	IP 00
3F480-400.230	300 – 400	580 x 230 x 158	22	IP 00
3F480-500.230	400 – 500	630 x 345 x 158	37.5	IP 00
3F480-600.230	500 – 600	660 x 375 x 187	42	IP 00
3F480-700.230	600 – 700	865 x 345 x 157	42	IP 00

Output reactors

The incorporation of output reactors is recommended for cable lengths from 100 metres and for 690 V systems. The switching of the output voltage results in voltage peaks in the motor windings (up to twice the DC link voltage with a rate of voltage rise du/dt of up to 5 kV/µs) due to parasitic capacitances in the cables. Such peaks can damage the motor insulation. With shielded cables, the parasitic capacitances are even higher. Output reactors serving to reduce the voltage peaks must be installed as close as possible to the converter output. The rate of voltage rise du/dt at the motor terminals is reduced to less than 500 V/µs.

Output reactors can be installed in parallel arrangements where higher currents are necessary, e.g. one reactor each per PEBB (Power Electronic Building Block).

Please feel free to contact us for further information.

Our 690 V cabinet system converters (VSI2.0CSxx-6) are provided with appropriate output reactors and overvoltage feedback as standard.

Technical data:
– Nominal voltage U_N = 800 V
– IP 00
– Suitable for cabinet installation
– Max. 40 °C ambient temperature

Type designation	Nominal current I_N (A)	L (mH)	Weight (kg)	Dimensions H x W x D (mm)
02A8	2.8	1.5	0.6	60 x 78 x 95
04A4	4.4	1	0.6	60 x 78 x 95
06A6	6.6	0.65	0.6	60 x 78 x 95
011A	11	0.4	1	65 x 96 x 105
014A	14.3	0.3	1	65 x 96 x 105
018A	18.2	0.25	1.2	74 x 96 x 105
026A	26.4	0.175	1.2	74 x 96 x 105
032A	32	0.15	1.7	84 x 125 x 140
065A	65	0.1	4	105 x 155 x 205
090A	90	0.1	8.4	120 x 90 x 235
146A	146	0.05	10.2	140 x 190 x 260
175A	175	0.05	13.4	160 x 210 x 180
275A	275	0.032	18.4	170 x 230 x 200
320A	320	0.025	18.9	170 x 230 x 200
410A	410	0.021	22.6	180 x 240 x 210

Overvoltage feedback

In combination with an output reactor, the overvoltage feedback limits the voltage at the motor terminals such that it does not exceed the DC link voltage + 100 V. This option is available for nominal voltages from 380 to 690 V and requires the option “Connection DC +/-”. The module dimensions are H x W x D = 250 x 145 x 95 mm.
Our 690 V cabinet system converters (VSI2.0CSxx-6) are provided with appropriate output reactors and overvoltage feedback as standard.

Sine-wave filters
A sine-wave filter is a passive LC filter which is used exclusively with VSI2.0 SD converters with a fixed switching frequency. The switching frequency must be adjusted for the individual filter. For further information, please refer to the filter selection matrix on page 27.

Technical data:
– Nominal voltage = 400 V ± 25%, 50/60 Hz (690 V upon request)
– Voltage drop approx. 25 V at nominal current and 50 Hz
– Overload: 110% for 5 min, 150% for 2 min or 200% for 30 s
– IP 20 = With housing and screw terminals
– IP 00 = No housing, busbar terminals
– Max. 40 °C ambient temperature

Type designation 3AFS400-	Degree of protection	Output (kW)	Nominal current (A)	Losses (W)	Weight (kg)	Dimensions H x W x D (mm)
002.5	IP 20	0.75	2.5	75	5	190 x 165 x 160
004	IP 20	1.5	4	90	5	190 x 165 x 160
007	IP 20	2.2	7	125	7	250 x 162 x 162
010	IP 20	4	10	165	9	250 x 162 x 162
013	IP 20	5.5	13	190	12	250 x 162 x 162
016	IP 20	7.5	16	220	13	300 x 210 x 180
025	IP 20	11	25	250	18	300 x 250 x 210
035	IP 20	15	35	275	25	300 x 270 x 235
010	IP 00	4	10	165	9	195 x 200 x 115
013	IP 00	5.5	13	190	12	250 x 200 x 115
016	IP 00	7.5	16	220	13	225 x 240 x 135
025	IP 00	11	25	250	18	270 x 250 x 160
035	IP 00	15	35	275	25	270 x 250 x 160
050	IP 00	22	50	320	45	280 x 300 x 250
063	IP 00	30	63	550	49	270 x 300 x 370
080	IP 00	37	80	380	65	324 x 360 x 320
100	IP 00	45	100	530	65	324 x 360 x 320
125	IP 00	55	125	650	85	335 x 390 x 320
150	IP 00	75	150	580	119	440 x 480 x 340
180	IP 00	90	180	760	131	440 x 480 x 340
250	IP 00	132	250	600	135	420 x 420 x 390
300	IP 00	160	300	1000	140	420 x 420 x 390
400	IP 00	200	400	1100	320	440 x 500 x 400
500	IP 00	250	500	1250	335	470 x 500 x 400

Common mode filters
Common mode filters serve to reduce common mode currents to values which will not result in damage to the motor bearings and are used especially with motors from shaft height 280 mm. All three motor phases must be passed through the common mode filter rings (without shield). Such filters can also be used to reduce EMC emissions in connection with input cables (sizes G to T69 require one common mode filter each per PEBB).

Control panels

Control panel for the cabinet door	– Scope of delivery: Connecting cable, blank panel and bracket. – The control panel of the converter can be removed and mounted on a cabinet door using the enclosed bracket. It is connected to the converter via the enclosed connecting cable. The blank panel ensures the IP 54 protection rating of the converter. Standard for all cabinet systems.
Hand-held control panel HCP 2.0	– Hand-held control panel with full functionality. Simple connection to the frequency converter for temporary use, e.g. for commissioning or maintenance. The hand-held control panel HCP 2.0 can be used to set parameters and to display parameter values or error messages. It is furthermore possible to copy parameter data from one frequency converter to another.
VEMoSoftCom + USB/RS232 kit	– A PC can be connected to the converter via the USB/RS232 adapter to record signals and to save/load parameters sets, e.g. for maintenance and repair work.

Further options

EMC glands for sizes B, C and D	– Metal EMC glands for the motor and braking resistor cables Current / Size: 3 – 6 A (M16 – M20) B 8 – 10 A (M16 – M25) B 13 – 18 A (M16 – M32) B 26 – 31 A (M12 – M32) C 37 – 46 A (M12 – M40) C 61 – 74 A (M50 – M20) D
Brake chopper	– All VEMoDRIVE converters can be provided with an integrated brake chopper (standard for type 8/9). – Brake choppers are designed for continuous braking at nominal drive load. The option is factory-installed and incorporates the option “Connection DC +/-” – A similarly available braking resistor (see below) is supplied separately.
Connection DC +/-	– DC +/- terminals for external access to the DC link of the converter. This option is a prerequisite for the use of overvoltage feedback.
Crane interface (High Dynamic)	– Isolated I/O interface for control signals between (existing) crane controllers and the crane option board (CRIO). – Available for 230 V_{AC} (27 kΩ, 120 – 250 V_{AC}) or 24 V_{DC} (2,7 kΩ , 15 – 36 V_{DC}) input signals – LED displays for all inputs and outputs – For DIN rail mounting – H x W x D = 125 x 150 x 50 mm

Converter nominal current (A)	Braking resistance* for converter input voltage (V_{AC}): 380 – 415	440 – 480	500 – 525	550 – 600	660 – 690
		VSI2.0-Type 8/9			
2 – 4.5	120	150	-	-	-
5 – 7.5	91	120	-	-	-
9.5	68	91	-	-	-
12	51	68	-	-	-
16	36	51	-	-	-
23	27	33	-	-	-
31	18	24	-	-	-
		VSI2.0-Type 1/2			
3 – 18	43	50	55	-	-
25 – 31	26	30	32	-	-
36 – 46	17	20	22	-	-
60 – 88	10	12	14	-	-
90 – 200	3.8	4.4	4.9	5.7	6.5
205 – 250	2.7	3.1	2 x 4.9	2 x 5.7	2 x 6.5
300 – 400	2 x 3.8	2 x 4.4	2 x 4.9	2 x 5.7	2 x 6.5
430 – 595	2 x 2.7	2 x 3.1	3 x 4.9	3 x 5.7	3 x 6.5
600 – 800	3 x 2.7	3 x 3.1	4 x 4.9	4 x 5.7	4 x 6.5
860 – 1000	4 x 2.7	4 x 3.1	5 x 4.9	5 x 5.7	5 x 6.5
1150 – 1250	5 x 2.7	5 x 3.1	6 x 4.9	6 x 5.7	6 x 6.5
1350 – 1500	6 x 2.7	6 x 3.1	7 x 4.9	7 x 5.7	7 x 6.5
1600 – 1750	7 x 2.7	7 x 3.1	8 x 4.9	8 x 5.7	8 x 6.5
1800	-	-	9 x 4.9	9 x 5.7	9 x 6.5
2000	8 x 2.7	8 x 3.1	10 x 4.9	10 x 5.7	10 x 6.5
2200 – 2250	9 x 2.7	9 x 3.1	11 x 4.9	11 x 5.7	11 x 6.5
2400 – 2500	10 x 2.7	10 x 3.1	12 x 4.9	12 x 5.7	12 x 6.5
2600	-	-	13 x 4.9	13 x 5.7	13 x 6.5
2800	-	-	14 x 4.9	14 x 5.7	14 x 6.5
3000	-	-	15 x 4.9	15 x 5.7	15 x 6.5

Braking resistors – Notes on configuration

Braking resistors serve to enable dynamic braking and are connected to the brake chopper (option) via the power terminals “DC+” and “R”. The resistor values $R_{braking}$ must be selected according to table alongside.

* A resistance specified as “N x value” means N resistors of the same type (one resistor each per PEBB)

The maximum possible braking power $P_{braking,max}$ is dependent on the braking voltage level $U_{braking}$ of the converter link:

Converter input voltage (V_{AC})	Braking link voltage $U_{braking}$ (V_{DC})
220 – 240	380
380 – 415	660
440 – 480	780
500 – 525	860
550 – 600	1000
660 – 690	1150

The maximum possible braking power $P_{braking,max}$ can then be calculated in accordance with the number of resistors N with:

$$P_{braking,max} = \frac{N \cdot (U_{braking})^2}{R_{braking}}$$

The dimensions of the resistor can be determined from the table below on the basis of the actually required braking power $P_{braking}$ and the duty cycle (ED), where

$$ED = \frac{t_{braking}}{120\ s}$$

A duty cycle of ED = 1 is always assumed for braking durations exceeding 120 s.

Type designation	Braking power $P_{braking}$ (kW) according to duty cycle (ED)					Dimensions H x W x D (mm)	
	100%	60%	40%	25%	6%	IP 54	
VPR 200-__R	0.2	0.32	0.47	0.74	3.6	200 x 60 x 31	
VPR 300-__R	0.3	0.48	0.71	1.11	5.4	250 x 60 x 31	
VPR 400-__R	0.4	0.63	0.94	1.48	7.2	301 x 60 x 31	
VPR 500-__R	0.5	0.80	1.18	1.85	9.0	370 x 60 x 31	
DEGT1VPR1000S_R-S	1	1.40	2.00	3.70	13.0	542 x 98 x 170	
						IP 20	IP 23
BEGT 13#05-__R	2.5	3.25	4.25	6.25	21.0	301 x 483 x 326	500 x 483 x 326
BEGT 13#08-__R	4.0	5.2	6.8	10.0	34.0	301 x 483 x 326	500 x 483 x 326
BEGT 13#10-_R_	5.0	6.5	8.5	12.5	42.5	301 x 483 x 326	500 x 483 x 326
BEGT 14#15-_R_	7.5	9.8	12.7	18.7	64	301 x 483 x 426	500 x 483 x 426
BEGT 15#20-_R_	10	13.0	17.0	25.0	85	500 x 483 x 526	301 x 483 x 526
BEGT 17#30-_R_	15	19.5	25.5	37.5	127	301 x 483 x 740	500 x 483 x 740
BEGT 25#40-_R_	20	26	34	50	170	601 x 484 x 526	800 x 484 x 526
BEGT 27#60-_R_	30	39	51	75	255	601 x 484 x 736	800 x 484 x 736
BEGT 37#90-_R_	40	52	68	100	340	1021 x 484 x 736	1181 x 484 x 736
BEGT 47#120-_R_	50	65	85	125	425	1321 x 483 x 736	301 x 483 x 736
2xBEGT 27#60-_R_	60	78	102	150	510	2x (601 x 484 x 736)	2x (800 x 484 x 736)
2xBEGT 37#78-_R_	70	91	119	175	600	2x (1021 x 484 x 736)	2x (1181 x 484 x 736)
2xBEGT 37#90-_R_	80	104	136	200	680	2x (1021 x 484 x 736)	2x (1181 x 484 x 736)
2xBEGT 47#120-_R_	100	130	170	250	850	2x (1321 x 483 x 736)	2x (1481 x 483 x 736)

When ordering braking resistors, please specify the nominal output, the resistance value and the degree of protection:

= 2 for IP 20 (e.g. BEGT 13205) / # = 4 for IP 23, (e.g. BEGT 13405)
__R: Resistance in ohms; example: 26R = 26 ohms
_R_: Resistance in ohms; example 6R5 = 6.5 ohms

Liquid cooling
Frequency converter for $I_N \geq 90$ A in sizes E – O and F69 – T69 can also be supplied with liquid cooling. The recooling is realised via a heat exchanger (water-water or water-air) which is not included in the scope of delivery. Connection is by way of rubber hoses with leak-proof quick couplings.

DC link reactors
A DC link reactor reduces the THDi of the input current to approx. 30–40% and raises the input power factor of the converter to 0.95. A reactor is integrated as standard for types 1/2. For types 8/9, an optional reactor can be supplied in the form of a line reactor.

Circuit-breaker instead of switch-disconnector
For cabinet systems in the 6-pulse version, the standard switch-disconnector can also be replaced with a circuit-breaker with protective function.

12-pulse version
To reduce mains pollution, it is possible to select a 12-pulse version for converters from size G. Converters with a 12 pulse input rectifier are connected by way of a three-winding transformer, which makes two three-phase systems with an electrical offset of 30° available on the secondary side. The mains-side THDi is reduced from 30 – 40% (6 pulse) to 10 – 12%. A further reduction to ≤5% can be achieved with our Low Harmonic converter series VSI2.0CLH.

12-pulse versions can only be supplied for even numbers of PEBBs (sizes G (2), H (4) and so on). Converters in 12 pulse versions are always designed with motor-operated circuit-breakers.

ELECTRIC DRIVES

FOR EVERY DEMAND

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