

KEB



COMBIVERT F5

MODULAR DRIVE 0.37 ... 900 kW

EN

F5 MULTI

OPEN-LOOP AND CLOSED-LOOP DRIVE CONTROLLER FOR SYNCHRONOUS AND ASYNCHRONOUS MOTOR...



The frequency inverter COMBIVERT F5 Multi is equipped with all functions and characteristics of the COMBIVERT F5 Compact series and furthermore especially prepared for closed-loop operation.

Very flexible because of plug-in feedback cards

- Resolver
- Incremental encoder, initiator
- Sin/Cos encoder
- Absolute encoder
- Hiperface®, EnDat®
- BISS or Tacho

and usable in the operation modes

KEB-SMM (SENSORLESS MOTOR MANAGEMENT) F5-G FIELD-ORIENTED CONTROL F5-M SYNCHRONOUS MOTOR CONTROL F5-S

Decentralized automation in the drive actuator with standard functions relieves superior control systems and create clear, compact programs.

- Speed and torque control
- Position control
- Synchronous speed control, electronic gear

or customer-specific solutions such as

- Cam switch
- Rotary table positioning
- Register function
- Contouring control
- Single-axis positioning



CONTROL TERMINAL HOUSING A



	P_N [kW]	housing	I_N [A]	I_{max} [A]	$f_{sN/max}$ [kHz]	EMC	part no.
3-PH. 230 V (180 ... 260 V)	0.37	A*	2.3	4.1	4/8	C1 ♦	05F5A1A-2E2F
	0.75	A*	4	7.2	8/16	C1 ♦	07F5A1A-2E2F
		D*					07F5A1D-2B_A
	1.5	D*	7	12.6	16	C1 ♦	09F5A1D-2B_A
	2.2	D*	10	18	16	C1 ♦	10F5A1D-2B_A
	4	D	16.5	29.7	8/16	C1 ♦	12F5A1D-1A_A
	5.5	E	24	36	8/16	C1 ♦	13F5A1E-16_A
	7.5	E	33	49.5	4/16	C1 ♦	14F5A1E-15_A
	11	G	48	86	8/16	C1 ♦	15F5A1G-19_F
	15	H	66	99	16	C1 ♦	16F5A1H-1B_F
	18.5	H	84	151	4/16	C1 ♦	17F5A1H-19_F
	22	R	100	150	8/16	C1 ●	18F5A1R-76_A
	30	R	115	172	8/16	C1 ●	19F5A1R-76_A
	37	R	145	217	8/16	C1 ▲	20F5A1R-76_A
45	R	180	270	8/16	C1 ▲	21F5A1R-76_A	

- internal (option)
- * 0.37 ... 2.2 kW = 1-/3-phase 230 V
- ♦ footprint (option)
- ▲ book-style (option)
- ★ mains choke generally required (page 26)
- ** module units 2 x P / 3 x P generally with output choke (page 26)

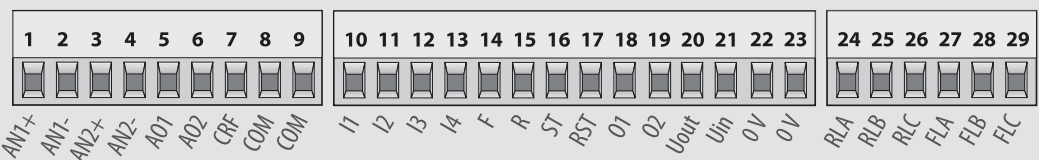
GENERALLY:

Product standard EN 61800-2, -5 - 1
 Emitted interference EN 61800-3
 EN 61000-6-1 ... 4
 Enclosure IP 20 / VBG 4
 Storage temperature -25 ... 70 °C
 Operation temperature -10 ... 45 °C
 from 90 kW -10 ... 40 °C
 Short-circuit and earth fault monitoring

Selection and dimensioning of the synchronous and asynchronous control motors occurs according to rated-, standstill- and peak current.

	P_N [kW]	housing	I_N [A]	I_{max} [A]	$f_{sN/max}$ [kHz]	EMC	part no.
3-PH. 400 V (305 ... 528 V)	0.75	A D	2.6	4.7	8/16	C1 ♦	07F5A1A-3E2F 07F5A1D-3B_A
	1.5	A D	4.1	7.4	8/4 8/16	C1 ♦	09F5A1A-3D2F 09F5A1D-3A_A
	2.2	D	5.8	10.4	4/16	C1 ♦	10F5A1D-3A_A
	4	D	9.5	17	8/16	C1 ♦	12F5A1D-3A_A
	5.5	D	12	21.6	4/16	C1 ♦	13F5A1D-39_A
	7.5	D	16.5	29.7	2/16	C1 ♦	14F5A1D-38_A
	11	E	24	36	4/16	C1 ♦	15F5A1E-35_A
	15	E	33	49.5	2/16	C1 ♦	16F5A1E-34_A
	18.5	G	42	63	4/16	C1 ♦	17F5A1G-35_A
	22	G	50	75	2/8	C1 ♦	18F5A1G-34_F
	30	H	60	90	4/16	C1 ♦	19F5A1H-35_F
	37	H	75	112	2/8	C1 ♦	20F5A1H-34_F
	45	R	90	135	4/16	C1 ●	21F5A1R-95_A
	55	R	115	172	4/16	C1 ●	22F5A1R-95_A
	75 ★	R	150	225	2/12	C1 ●	23F5A1R-94_A
	90 ★	R	180	270	2/8	C1 ▲	24F5A1R-94_A
	110 ★	U	210	263	4/8	C2/C1 ▲	25F5A1U-91_A
	132 ★	U	250	313	4/8	C2/C1 ▲	26F5A1U-91_A
	160 ★	U	300	375	2/8	C2/C1 ▲	27F5A1U-90_A
	200 ★	P	370	463	2/4	C2 ▲	28F5A1P-90_A
	250 ★	P	460	575	2/4	C2 ▲	29F5A1P-90_D
	315 ★	W	570	713	2/4	C2 ▲	30F5A1W-A0_A
	355 ★	W	630	787	2/4	C2 ▲	31F5A1W-A0_D
	400 ★	W	710	887	2/4	C2 ▲	32F5A1W-A0_D
450 ★	2 x P**	800	1000	2/4	C2 ▲	33F5A1P-90_D	
500 ★	2 x P**	890	1112	2/4	C2 ▲	34F5A1P-90_D	
560 ★	2 x P**	1000	1250	2/4	C2 ▲	35F5A1P-90_D	
630 ★	3 x P**	1150	1438	2/4	C2 ▲	36F5A1P-90_D	
710 ★	3 x P**	1330	1663	2/4	C2 ▲	37F5A1P-90_D	
800 ★	3 x P**	1450	1813	2/4	C2 ▲	38F5A1P-90_H	

CONTROL TERMINAL HOUSING D ... W



PROVEN CHARACTERISTICS FOR THE USE IN THE UPPER POWER RANGE

	P_N [kW]	housing	I_N [A]	I_{max} [A]	$f_{sN/max}$ [kHz]	inverter part no.	EMC filter ▲ part no.	mains choke part no.	motor choke part no.
3-PH. 660/690 V (600 ... 760 V)	200 ★	1 x P	225	281	2/4	28F5A1P-B0_A	1 x 30E5T60-8001	1x 28Z1B06-1000	1 x 29Z1A04-1001
	250 ★	1 x P	280	350	2/4	29F5A1P-B0_D	1 x 30E5T60-8001	1x 29Z1B06-1000	1 x 29Z1A04-1001
	315 ★	1 x P	345	438	2/4	30F5A1P-B0_A	1 x 30E5T60-8001	1x 30Z1B06-1000	1 x 29Z1A04-1001
	400 ★	2 x P**	430	538	2/4	32F5A1P-B0_A	2 x 30E5T60-8001	2x 28Z1B06-1000	2 x 29Z1A04-1001
	450 ★	2 x P**	500	613	2/4	33F5A1P-B0_D	2 x 30E5T60-8001	2x 29Z1B06-1000	2 x 29Z1A04-1001
	500 ★	2 x P**	550	688	2/4	34F5A1P-B0_D	2 x 30E5T60-8001	2x 30Z1B06-1000	2 x 29Z1A04-1001
	560 ★	2 x P**	620	763	2/4	35F5A1P-B0_D	2 x 30E5T60-8001	2x 30Z1B06-1000	2 x 29Z1A04-1001
	630 ★	3 x P**	710	875	2/4	36F5A1P-B0_A	3 x 30E5T60-8001	3x 29Z1B06-1000	3 x 29Z1A04-1001
	710 ★	3 x P**	820	1013	2/4	37F5A1P-B0_D	3 x 30E5T60-8001	3x 30Z1B06-1000	3 x 29Z1A04-1001
	800 ★	3 x P**	900	1100	2/4	38F5A1P-B0_D	3 x 30E5T60-8001	3x 30Z1B06-1000	3 x 29Z1A04-1001
	900 ★	3 x P**	1015	1250	2/4	39F5A1P-B0_H	3 x 30E5T60-8001	3x 30Z1B06-1000	3 x 29Z1A04-1001

** module units 2 x P / 3 x P generally with output choke (page 26)

★ mains choke generally required (page 26)

▲ book-style (option)

All units correspond to the 400 V type with regard to the technical functions and are universally suitable for the open-loop and closed-loop operation of asynchronous and synchronous motors. Upon request the units are available for rated voltages of 3-phase 500 V AC and 3-phase 600 V AC.

GENERALLY:

Product standard EN 61800-2, -5 – 1
 Emitted interference EN 61800-3
 EN 61000-6-1 ... 4

Enclosure IP 20 / VBG 4
 Storage temperature -25 ... 70 °C
 Operation temperature -10 ... 40 °C
 Short-circuit and earth fault monitoring



ASYNCHRONOUS DRIVE TECHNOLOGY OF THE TOP CLASS

COMBIVERT F5-H (ASCL) and with internal safety F5-L is the result of long lasting model optimization of encoder-less field orientation and offers as result best speed and torque characteristics with asynchronous motors without encoder feedback.

ASCL

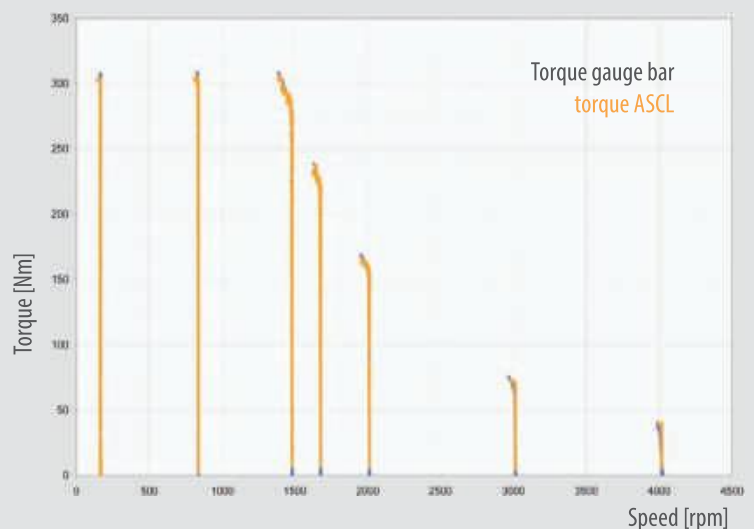
PROPERTIES

- High speed stability
- Load step response like closed-loop systems
- Torque accuracy typically $< 3\%$ MN
- Display values with correction adjustment in the system „on the fly“
- Operation with output filters
- Low installation costs in case of loss of encoder cable, encoder and encoder interface
- Optimized efficiency in partial load range
- Automatic adaption of the motor
 - Calibration routine of stator- and rotor resistance, main- and leakage inductance and dead time characteristic
 - Thermal calculation in the motor model
- Controller integration → symmetrical optimum
 - Simplifies the Ki/Kp calibration of the exterior closed circuit (speed)
 - Only one parameter for drive optimization
 - Speed preset
- Exact torque display by
 - Determination of torque-offsets and elimination in the display

POTENTIAL APPLICATIONS

- Extruder main drives
- Crusher drives / shredder
- Centrifuges
- Test bench / test systems
- Stirring and mixer units
- Meat cutter and mincer
- Mixing plants
- Heat pumps
- Hydraulic pumps
- Generators
- Machine tools for wood, plastic, metal, ...

TORQUE CHARACTERISTIC



		BASIC	COMPACT	MULTI		SCL		ASCL	
CONTROLBOARD INVERTER HOUSING		B ABDE	C BDEGHR	A A	A / K DEGHRUWP	A A	E / P DEGHRUWP	H / L DEGHRUWP	
Operating mode	open-loop	•	•	•	•	-	-	•	
	closed-loop	-	-	•	•	•	•	•	
	encoder-less closed-loop	-	-	-	-	•	•	•	
	AC servo mode	-	-	•	•	•	•	•	
	flux vector mode	-	-	•	•	•	•	•	
	encoder-less vector mode (KEB SMM - sensor less motor management)	•	•	•	•	-	-	•	
	standard v/f mode	•	•	•	•	-	-	•	
Controlboard	voltage supply	intern	intern	extern	intern	extern	intern	intern	
	internal voltage supply	24 V DC	24 V DC	-	24 V DC	-	24 V DC	24 V DC	
	24 V DC supply external	no	yes	yes	yes	yes	yes	yes	
	I/O scan time	2 ms	2 ms	1 ms	1 ms	1 ms	1 ms	1 ms	
	number of terminals	17	29	17	29	17	29	29	
	pluggable control terminals	yes	yes	yes	yes	yes	yes	yes	
digital	number	5	8	5	8	5	8	8	
	specification	PNP	PNP/NPN	PNP	PNP/NPN *	PNP	PNP/NPN *	PNP/NPN *	
INPUT	adjustable	-	•	-	•	-	•	•	
			13...30 V DC						
	analogue	number	1	2	1	2	1	2	2
		specification	0 ... ± 10 V	•	•	•	•	•	•
		0 ... ± 20 mA / 4 ... 20 mA	-	•	-	•	-	•	•
		potential-free	(single-ended)	•	•	•	•	•	•
		resolution	11 bit	12 bit	11 bit	12 bit	11 bit	12 bit	12 bit
fast scan time		no	250 ms	250 ms	250 ms	250 ms	250 ms	250 ms	
sample and hold mode	yes	yes	yes	yes	yes	yes	yes		
digital	number	0	2	2	2	2	2	2	
	specification open-collector (50 mA total)	-	•	•	•	•	•	•	
relay	number	2	2	1	2	1	2	2	
	specification potential-free (30 VDC / 1 A)	•	•	•	•	•	•	•	
analogue	number	1	2	1	2	1	2	2	
	specification	0 ... 10 V; ± 10 V	•	•	•	•	•	•	
	resolution	(5 mA)	2x (5 mA)	(5 mA)	2x (5 mA)	(5 mA)	2x (5 mA)	2x (5 mA)	
ENCODER FEEDBACK		-	-	standard	option card	standard	option card	option card	
	2 encoder inputs	-	-	•	•	•	•	•	
	positioning to second encoder	-	-	•	•	•	•	•	
	encoder emulation TTL output	-	-	•	•	•	•	•	
	analogue encoder	-	-	resolver	resolver	resolver	resolver	resolver	
					Sin/Cos		Sin/Cos	Sin/Cos	
					UVW encoder		UVW encoder	UVW encoder	
					tacho generator		tacho generator	tacho generator	
	digital encoder	-	-	TTL	TTL	TTL	TTL	TTL	
					HTL		HTL	HTL	
					initiator		initiator	initiator	
	serial encoder	-	-	-	BiSS	-	BiSS	BiSS	
	(single- und multi-turn)				EnDat		EnDat	EnDat	
					Hiperface		Hiperface	Hiperface	
					SSI		SSI	SSI	
				SSI-Sin/Cos		SSI-Sin/Cos	SSI-Sin/Cos		

• included

* not for K / L / P

	BASIC	COMPACT	MULTI		SCL		ASCL
	B ABDE	C BDEGHR	A A	A / K DEGHRUWP	E / P A	DEGHRUWP	H / L DEGHRUWP
CONTROL BOARD							
INVERTER HOUSING							
SPEED MODE	Hz	Hz	Hz, rpm	Hz, rpm	rpm	rpm	Hz, rpm
separate S-curve ACC/DEC	•	•	•	•	•	•	•
separate lower/upper S-curve times	-	-	•	•	•	•	•
sep. acceleration time for counter clockwise-/clockwise rotation	•	•	•	•	•	•	•
sep. deceleration time for counter clockwise-/clockwise rotation	•	•	•	•	•	•	•
ogive function	-	-	•	•	•	•	•
speed search (aligning the motor)	•	•	•	•	•	•	•
fast analogue input	•	•	•	•	•	•	•
2 analogue inputs with prog. function	-	•	-	•	-	•	•
fixed speed / fixed frequency	4	4	4	4	4	4	4
fixed speed / fixed frequency with set-programming	16	32	16	32	16	32	32
POSITIONING MODE							
simple repeatable positioning without encoder	•	•	-	-	-	-	-
positioning via motor encoder	-	-	•	•	-	-	-
positioning via external encoder	-	-	•	•	-	-	-
position value resolution	-	-	32 bit	32 bit	-	-	-
internally storable positions	-	-	32	32	-	-	-
analogue setpoint setting for target position	-	-	•	•	-	-	-
different reference routines	-	-	•	•	-	-	-
limit switch protection	-	-	•	•	-	-	-
relative-/absolute positioning	-	-	•	•	-	-	-
interruption in the positioning	-	-	•	•	-	-	-
rotary table positioning	-	-	•	•	-	-	-
rotary table positioning with shortest path	-	-	•	•	-	-	-
contouring with bus	-	-	•	•	-	-	-
synchronisation mode	-	-	•	•	-	-	-
positional synchronisation	-	-	•	•	-	-	-
speed synchronisation	-	-	•	•	-	-	-
programmable gearshifts	-	-	8	8	-	-	-
gearshift via analog input	-	-	•	•	-	-	-
angle adjustment	-	-	•	•	-	-	-
synchronisation with constant distance or ramp	-	-	•	•	-	-	-
torque mode	-	-	•	•	•	•	•
adjustable torque for all operating conditions	-	-	•	•	•	•	•
adjustable torque for ACC/DEC	-	-	•	•	•	•	•
adjustable torque for motor/regen operation	-	-	•	•	•	•	•
analogue torque setting	-	-	•	•	•	•	•
fast analog torque setting	-	-	250 µs	250 µs	250 µs	250 µs	250 µs
acceleration at torque limit	-	-	•	•	•	•	•
FUNCTIONS							
PID process control	•	•	•	•	•	•	•
automatic motor identification	-	-	•	•	•	•	•
automatic rotor position detection in standstill	-	-	•	•	•	•	-
torque precontrol	-	-	•	•	•	•	•
brake control / handling	•	•	•	•	•	•	•
power off / braking without mains voltage	•	•	•	•	•	•	•
programmable restart-starting conditions	-	-	•	•	•	•	•
programmable timer/counter (sec/h/inc)	2	2	2	2	2	2	2
max. input frequency of the counter	250 Hz	250 Hz	500 Hz	500 Hz	500 Hz	500 Hz	500 Hz

• included