Bharat Bijlee

KEB

COMBIVERT **F6**

DRIVE CONTROLLER **2.2 ... 450 kW**

EN

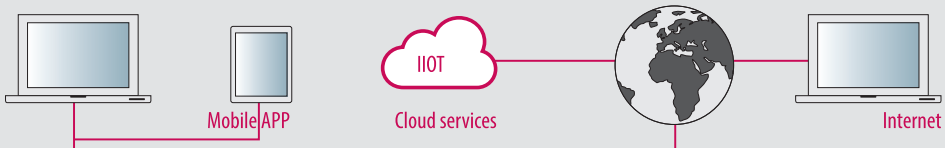
KEB

SYSTEM OVERVIEW

Automation **with Drive**
stands as a synonym for optimally selected combinations of control and automation solutions with the drive level at the end it is the key to successful machine concepts.

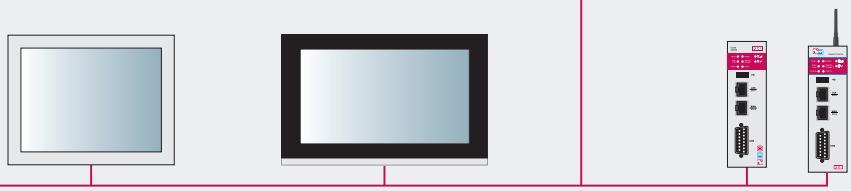
Let the following pages inspire you with regards to the diversity and performance of the COMBIVERT F6 drive controller, and help you to find a solution that reliably meets your requirements.

SOFTWARE

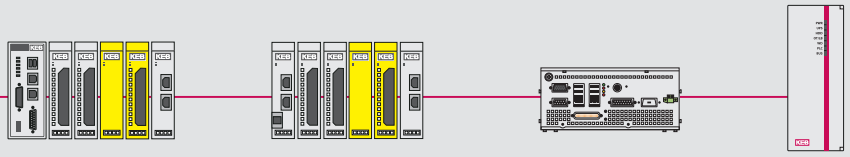


V g RC

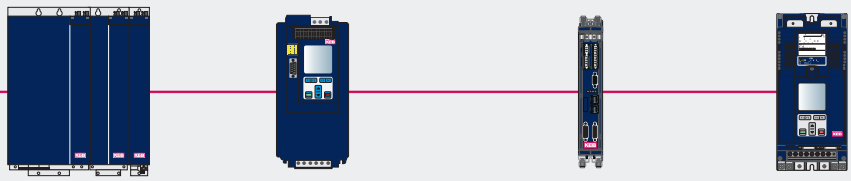
HMI



CONTROL

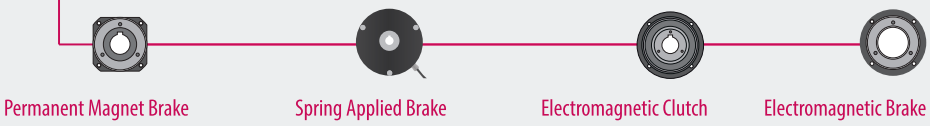


DRIVES



MOTORS

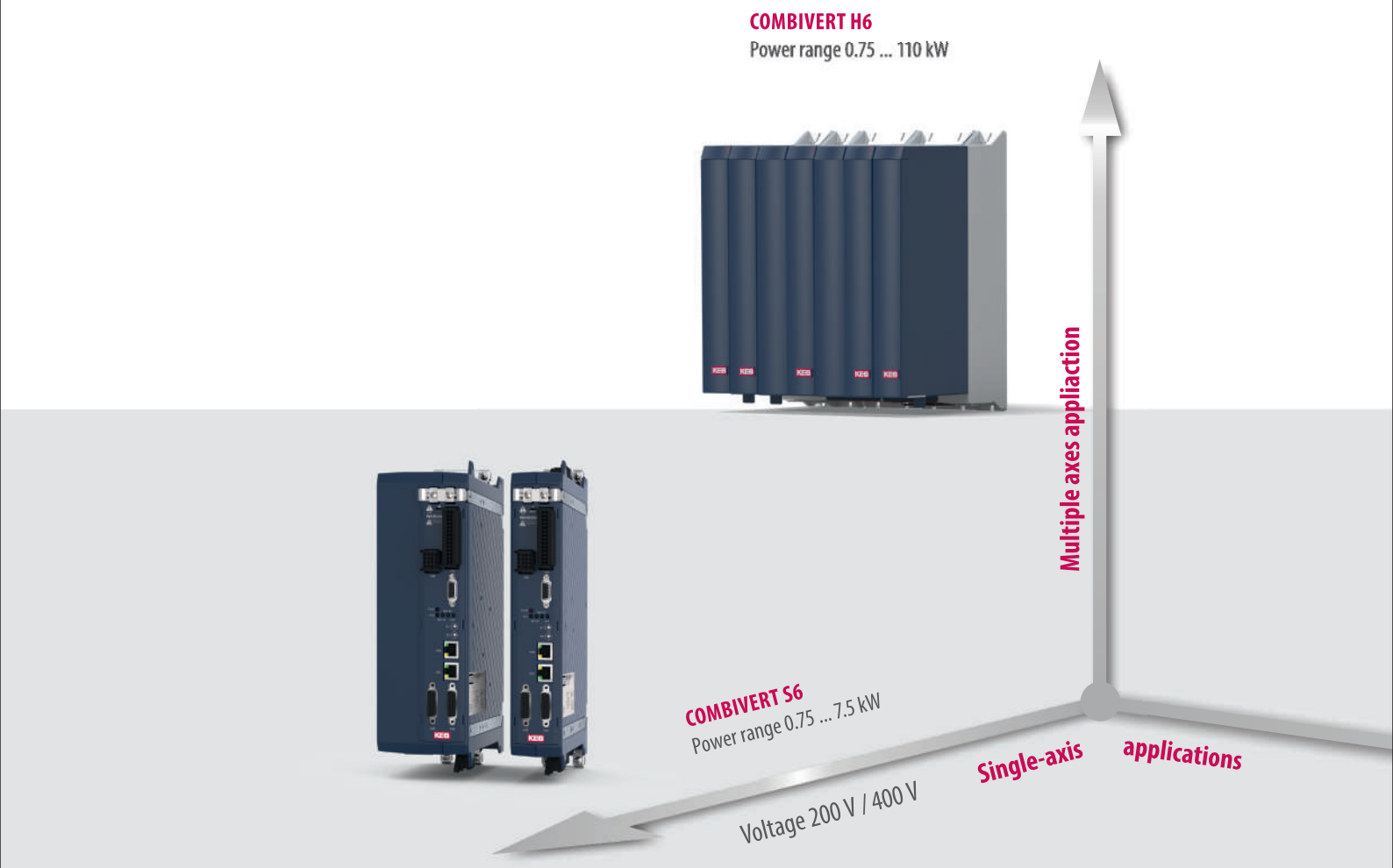
BRAKES & CLUTCHES



OPTIMALLY SELECTED COMPONENTS

Flexibility, functionality, efficiency and cost-effectiveness are the key requirements for today's drive system. The single axis drive controller COMBIVERT F6, in the power range from 2.2 to 450 kW is covering these requirements and is a perfect extension of the KEB drive portfolio.

The COMBIVERT F6 with its capability to operate different motor types, the various real-time communication to higher-level controllers, the choice of integrated Safety function modules or the cooling concept is the perfect drive controller for every machine. The intuitive PC tool COMBIVIS 6 makes the newly developed KEB drive platform easy to handle.



DRIVE BASED SAFETY

- Integrated Safety functionality
- Basic function STO in Compact variant
- Additional High Level Safety in Application variant
- Encoderless safety in variant PRO

ALL IN ONE - UNIVERSAL MOTOR OPERATIONS

- Control for synchronous, asynchronous, IPM or synchronous reluctance motors
- Motor operation with encoder feedback or encoderless ASCL/SCL for precise speed control
- Motor temperature monitoring with PTC, KTY or PT1000 sensors
- Two-channel multi-encoder interface
- Integrated GTR7 brake transistor
- Integrated brake control and brake supply

REAL - TIME COMMUNICATION

or simply serially

- Real-time Ethernet-based interfaces
- CAN
- RS232/485 for diagnostics or display

ANALOG & DIGITAL I/O

supports actual machine concepts with

- 8 digital and 2 analog inputs
- 2 digital and 1 relay output
- 1 analog output 0 ... 10 V

COMBIVERT F6
Power range 2.2 ...450 kW

Voltage 200 V / 400 V

HIGHLIGHTS

- Uncompromising integration, highest perfomance
- Modern realtime communication standards
- Integrated functional safety
- Particular compact size
- Modular design, flexible cooling systems

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FUNCTIONAL SAFETY

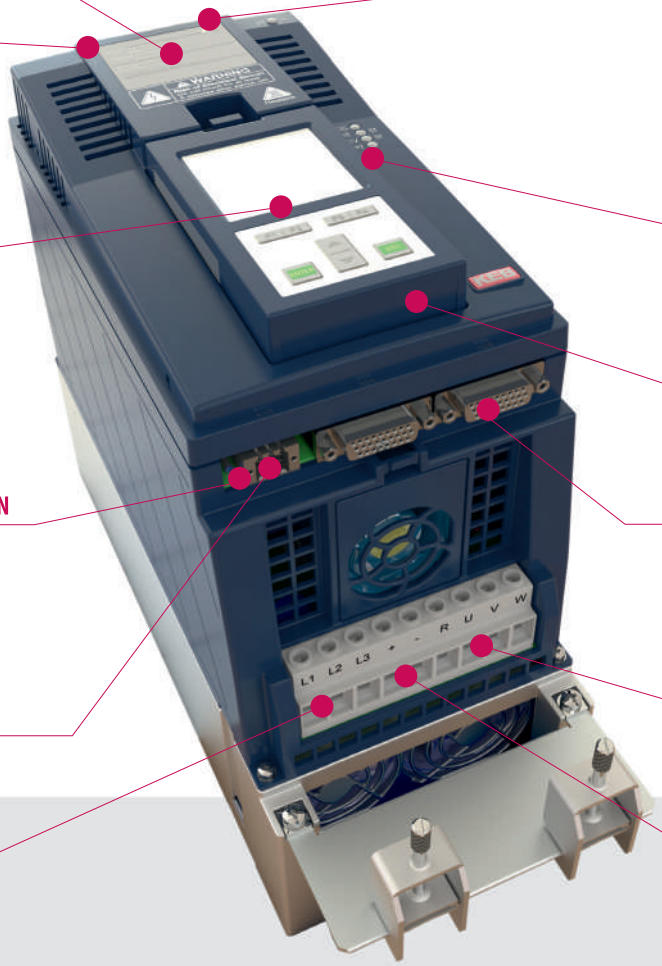
INTERFACES
CAN interface
Realtime Ethernet

LCD DISPLAY
LCD Operator
Ethernet Operator
USB Operator

PTC/KTY/PT1000 EVALUATION

BRAKE CONTROL 24 V / 2 A

MAINS CONNECTIONS



I/O
8 digital inputs
2 digital outputs
1 relay
2 analog inputs
1 analog output
24V DC supply

STATUS LEDS

DIAGNOSTIC INTERFACE

MULTI ENCOCER INTERFACES
Resolver, EnDAT, HIPERFACE, BISS, SSI,
Incremental HTL/TTL,
Incremental output

MOTOR TERMINALS

DC SUPPLY TERMINALS
and braking resistor

EtherCAT® Sov EtherCAT® VARAN CANopen®

HIGHLIGHTS

- Universally usable for many motor technologies
- Highest performance in torque, speed and position control
- Uncompromising integration
- User-friendly
- Scalable safety functions...

COMPACT
HIGHLY INTEGRATED AND ECONOMICAL

STO

REALTIME ETHERNET

EtherCAT OR VARAN

Communication interface

CAN
DIAGNOSTIC RS232/485

APPLICATION
MODULAR AND FLEXIBLE

STO, SBC and speed/position related safety functions

REALTIME ETHERNET

EtherCAT
PROFINET
POWERLINK
EtherNet/IP

Communication interface

CAN
DIAGNOSTIC RS232/485

PRO
ENCODERLESS SAFETY

STO, SBC and speed related safety functions without encoder feedback

REALTIME ETHERNET

EtherCAT

Communication interface

CAN
DIAGNOSTIC RS232/485
Ethernet

PROFINET®

ETHERNET POWERLINK

EtherNet/IP®

HIGHLIGHTS

- Brake handling
- Power-off
- DC-brake
- PID controller
- Round table function
- Recipe management
- Multi motor handling
- Anti cogging
- Liquide cooling management
- Etc.

BASIS FOR SAFETY

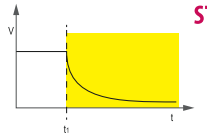
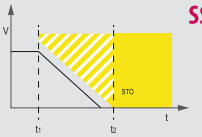
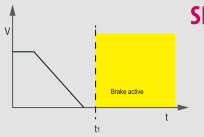
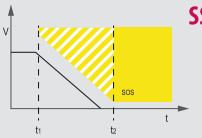
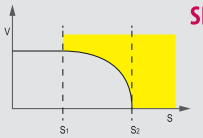
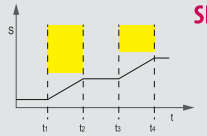
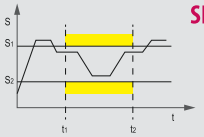
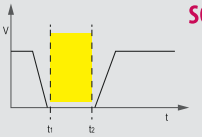
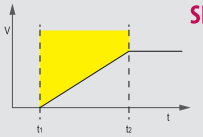
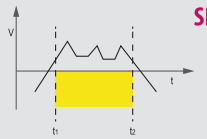
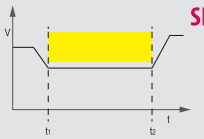
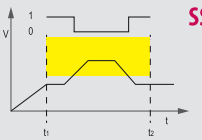
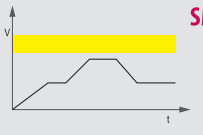
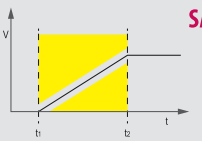
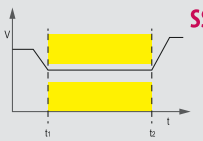
COMPACT

In the Compact variant, the COMBIVERT F6 and S6 drive controllers are equipped with Safe-Torque-Off (STO).

SAFETY FUNCTIONS WITH SPEED AND POSITION MONITORING

APPLICATION

The device variant Application is available in two versions. In addition to STO, Module 1 adds safe brake control (SBC) which provides a safe 24 V supply for the brakes.
Module 3 offers safe motion functionality according to IEC 61800-5-2 through speed and position detection using encoders.
The error reaction time is shortened and costs are reduced by reducing the number of separate protective devices. Module 3 also offers the option of controlling all available safety functions and limit values via Safety over EtherCAT (FSoE).

COMPACT	APPLICATION		
on board	Module 1	Module 3	Sov EtherCAT®
STO  Safe Torque OFF	STO  Safe Torque OFF	SS1  Safe Stop 1	
	SBC  Safe Brake Control	SS2  Safe Stop 2	SEL  Safe Emergency Limit
SLI  Safely-Limited Increment	SLP  Safely-Limited Position	SOS  Safe Operating Stop	SLA  Safely-Limited Acceleration
SDI  Safe Direction	SLS  Safely-Limited Speed	SSM  Safe Speed Monitor	SMS  Safe Maximum Speed
		SAR  Safe Acceleration Range	SSR  Safe Speed Range

ENCODERLESS SAFETY FUNCTIONS

PRO

The Pro device variant of the COMBIVERT F6 and S6 drive controllers offers advanced safety functions without having to use a safety encoder. The device determines the safe velocity parameters from the pulse width modulation (PWM) of the motor supply.

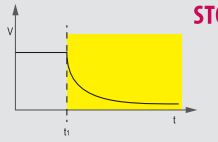
In addition to STO, Module 5 is equipped with a safe brake control (SBC), which provides a safe 24 V supply for braking operation as well as a monitoring of the switching status of the brake via microswitch evaluation.

Module 5 also offers the option of controlling all available safety functions via Safety over EtherCAT (FSoE).

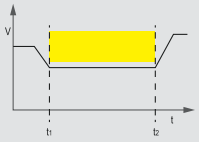
PRO

Module 5

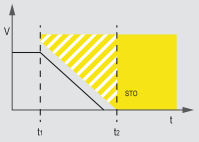
Sov EtherCAT®



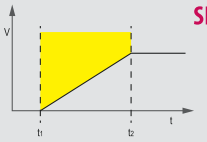
Safe Torque OFF



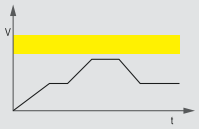
Safely-Limited Speed



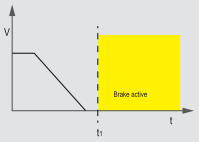
Safe Stop 1



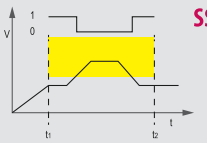
Safely-Limited Acceleration



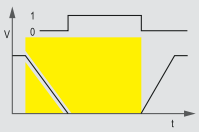
Safe Maximum Speed



Safe Brake Control



Safe Speed Monitor



Safe Door-Lock Control

WHY USE DRIVE-BASED SAFETY (SAFE MOTION)?

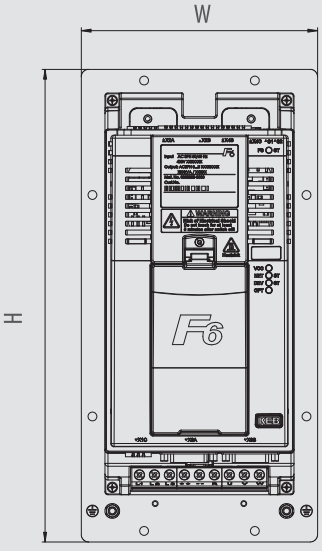
- Less wiring remove contactors and other traditional safety components
- Fast reaction direct handling inside the drive
- Easy to operate up to 8 different safety setups per function
- Cost savings compared to traditional safety solution

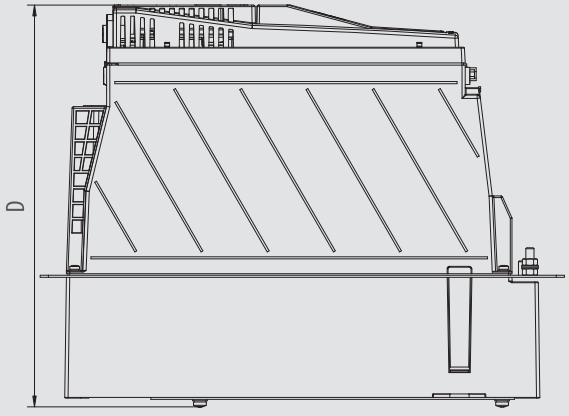
TECHNICAL DATA

HOUSING		F6-2				F6-3			F6-4
Device size		**10**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Rated output power	[kVA]	4.4	7	9.6	13	19	25	30	34
Typical rated motor power	[kW]	2.2	4	5.5	7.5	11	15	18.5	22
Rated output current 230 V	[A]	11	17.5	24	33	48	60	75	85
Rated output current 240 V (UL)	[A]	11	17.5	24	33	48	60	75	85
Short-term current limit (60 s / max.)	[%]	150 / 216		150 / 180		150 / 216			150 / 180
Rated input current 230 V	[A]	16.5	22	30	41.5	on request			101
Rated input current 240 V (UL)	[A]	16.5	22	30	41.5	on request			101
Rated switching frequency	[kHz]	8	4	4	4	2	4	2	4
Max. switching frequency	[kHz]	16							
Mains phases		3							
Rated input voltage (AC)	[V]	230 (UL: 240)							
Input voltage range (AC)	[V]	170 ... 264							
Input voltage range (DC)	[V]	240 ... 373							
Mains frequency	[Hz]	50 / 60 ±2							
Output voltage	[V]	3 x 0 ... U_{IN}							
Output frequency	[Hz]	0 ... 599 (optional 0 ... 2,000)*							

** The maximum possible output frequency depends on the switching frequency*

THROUGH MOUNT VERSION





HOUSING		F6-2					F6-3				F6-4			
Device size		**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**19**	**20**	**21**	**22**
Rated output power	[kVA]	6.6	8.3	11.4	16.6	22.9	29	35	42	52	42	52	62	76
Typical rated motor power	[kW]	4	5.5	7.5	11	15	18.5	22	30	37	30	37	45	55
Rated output current 400 V	[A]	9.5	12	16.5	24	33	42	50	60	75	60	75	90	110
Rated output current 480 V (UL)	[A]	7.6	11	14	21	27	34	40	52	65	52	65	77	96
Short-term current limit (60 s / max.)	[%]	150 / 216			150 / 180									
Rated input current 400 V	[A]	13	17	21	31	43	55	59	66	82	66	82	99	121
Rated input current 480 V (UL)	[A]	11	15	18	27	35	44	48	57	71	57	71	85	106
Rated switching frequency	[kHz]	8	8	4	4	4	2	2	2 / 4	2	4	4	2	2
Max. switching frequency	[kHz]	16												
Mains phases		3												
Rated input voltage (AC)	[V]	400 (UL: 480)												
Input voltage range (AC)	[V]	280 ... 550												
Input voltage range (DC)	[V]	390 ... 780												
Mains frequency	[Hz]	50 / 60 ±2												
Output voltage	[V]	3 x 0 ... U_{IN}												
Output frequency	[Hz]	0 ... 599 (optional 0 ... 2,000)*												

** The maximum possible output frequency depends on the switching frequency*

MECHANICAL DIMENSIONS

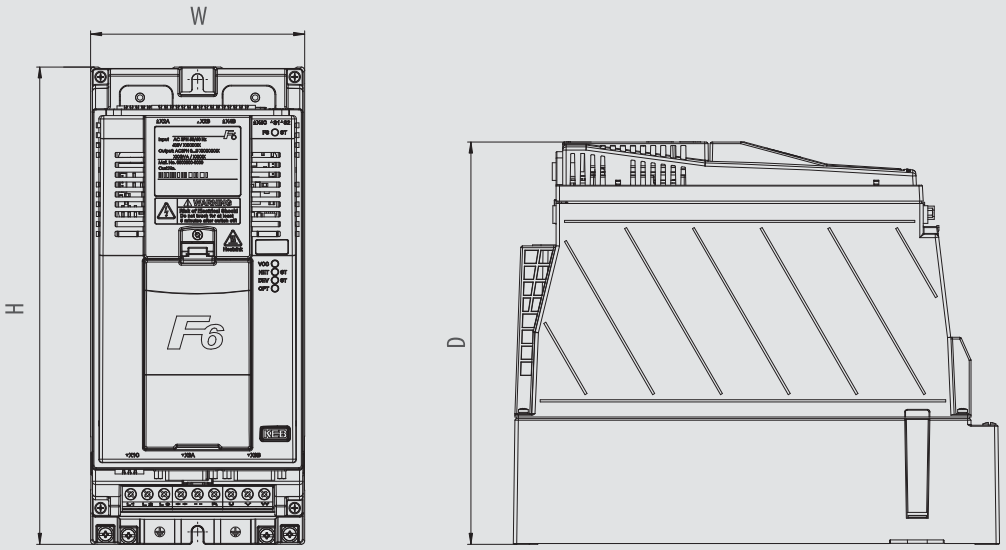
HOUSING	H*** (mm)	W*** (mm)	D*** (mm)	AIR COOLING		LIQUID COOLING	
				in-built	through mount	in-built	through mount
2	290	130	240	X	X	-	-
3	340	170	261	X	X	-	-
4	375	224	272	X	X	X	X
6	525	249	272	X	X	X	X
7	570	336	360	X	X	X	X
8	860	336	360	X	X	X	X
9	960	503	360	X	X	X	X

**** air cooled in-built version*

HOUSING		F6-6				F6-7				F6-8			F6-9			
Device size		**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**28**	**29**	**30**	**30**	**31**	**32**	**33****
Rated output power	[kVA]	62	80	104	125	145	173	208	256	256	319	395	395	436	492	554
Typical rated motor power	[kW]	45	55	75	90	110	132	160	200	200	250	315	315	355	400	450
Rated output current 400 V	[A]	90	115	158	189	210	250	300	370	370	460	570	570	630	710	800
Rated output current 480 V (UL)	[A]	85	106	128	162	180	210	260	325	302	414	477	477	515	590	719
Short-term current limit (60 s / max.)	[%]	150 / 180				125 / 150						150 / 180	125 / 150			
Rated input current 400 V	[A]	99	126	158	189	221	263	315	390	390	485	600	600	700	746	840
Rated input current 480 V (UL)	[A]	85	106	128	162	186	217	269	337	374	429	494	494	533	611	744
Rated switching frequency	[kHz]	8	4	2/4/8**	2	4	4	2	2	4	2	2	2	2	2	2
Max. switching frequency	[kHz]	16											4			
Mains phases		3														
Rated input voltage (AC)	[V]	400 (UL: 480)														
Input voltage range (AC)	[V]	280 ... 550														
Input voltage range (DC)	[V]	390 ... 780														
Mains frequency	[Hz]	50 / 60 +/- 2														
Output voltage	[V]	3 x 0 ... U_{IN}														
Output frequency	[Hz]	0 ... 599 (optional 0 ... 2,000)*														

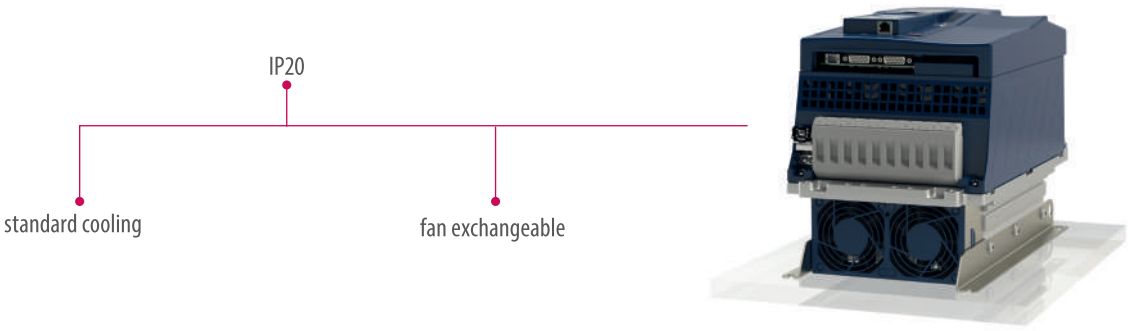
** The maximum possible output frequency depends on the switching frequency*
*** Liquid cooled only*

BUILT-IN VARIANT

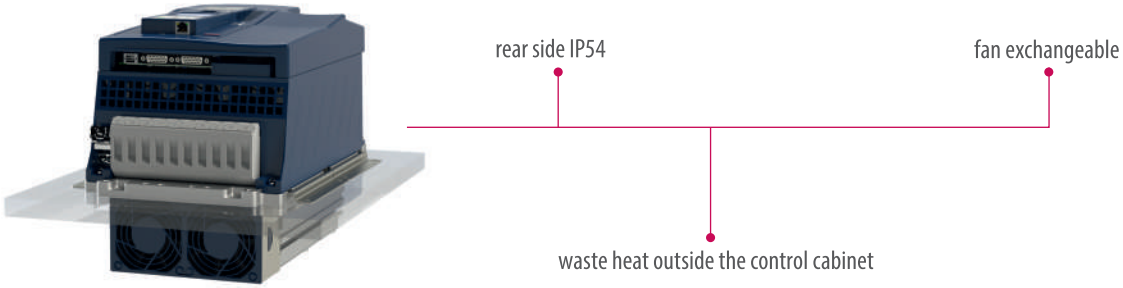


FLEXIBLE COOLING FOR DIFFERENT APPLICATIONS

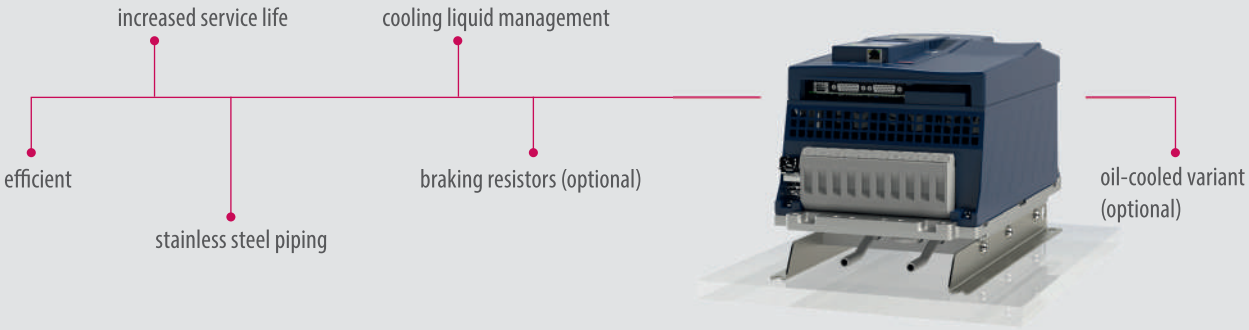
Air-cooled built-in variant



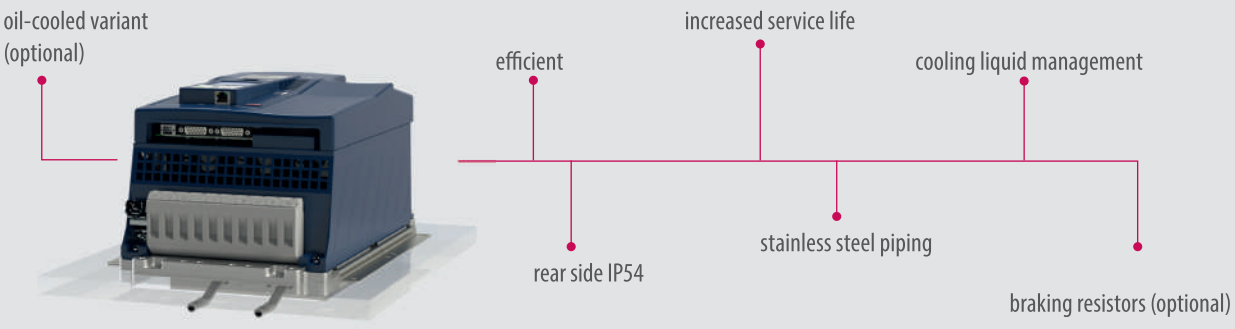
Air-cooled push-through variant



Liquid-cooled built-in variant



Liquid-cooled push-through variant



COMBIVIS 6

- Free and easy-to-use software for startup, administration and analysis
- Integrated start-up assistants (Wizards) for quick and easy configuration
- Direct access to device documentation
- 16 channel oscilloscope for extensive analysis
- Online parameter list comparison
- Parameterisation of key safety indicators and functions

COMBIVIS studio 6

The intelligent automation suite from KEB combines an assistant-guided component selection, fieldbus configuration, drive parameterisation, IEC 61131-3 project generation and motion control. Throughout the planning and layout phase, implementation of control sequences and multi-axis movement profiles, to start-up and fine tuning, the user is supported by a tool developed by experienced application engineers.

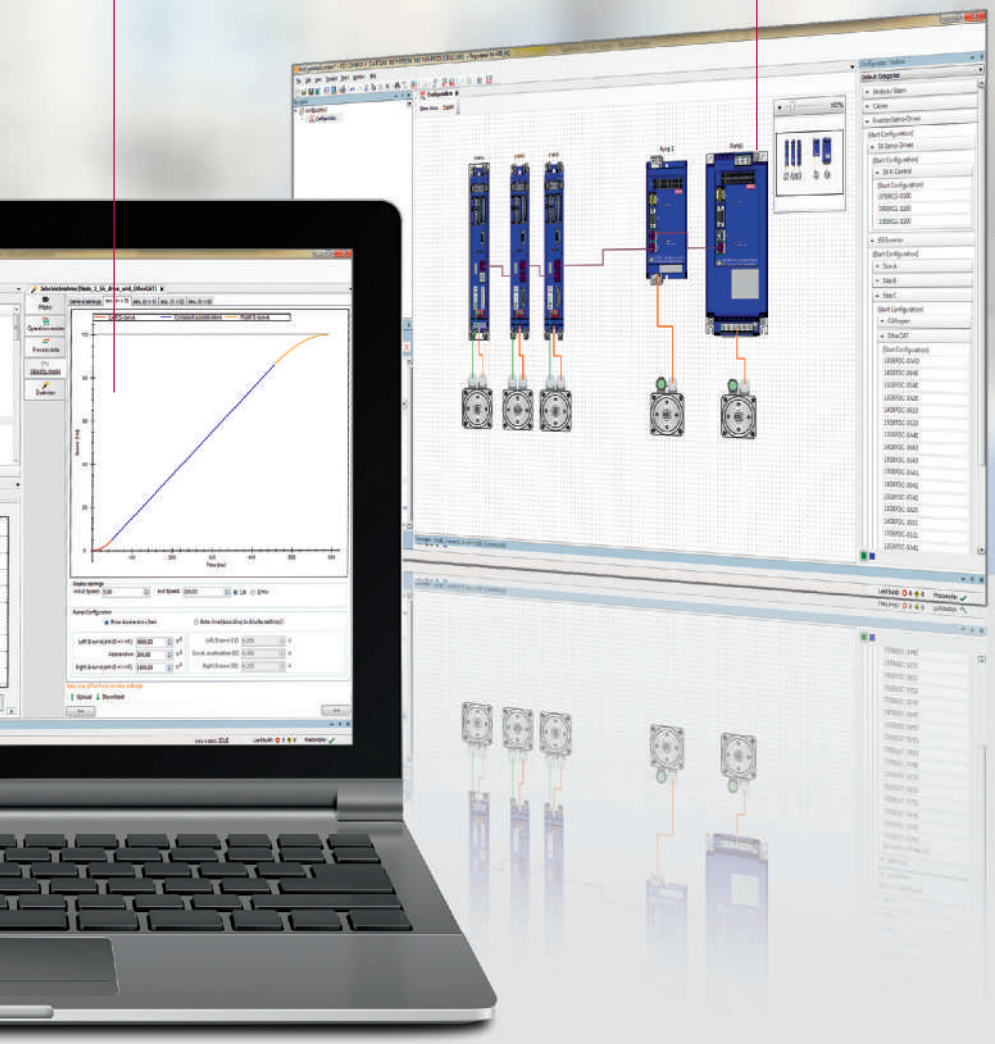
With a foundation built on libraries, devices and template databases, rapid and simple solutions can be generated for a wide range of applications.

COMMISSIONING ASSISTANT

- Complete user guidance through the commissioning process
- KEB Motor database, free for extensions
- Anti cogging
- Fieldbus diagnostic and optimisation

SYSTEM CONFIGURATION AS A COMPONENT OF COMBIVIS

- Access to KEB product database
- Intuitive gear component selection and system configuration using drag and drop
- Selection assistant with display of compatible components
- Display of all interfaces and connection components
- Material number generator
- Extensive export function for quote list, COMBIVIS Project, Excel ...

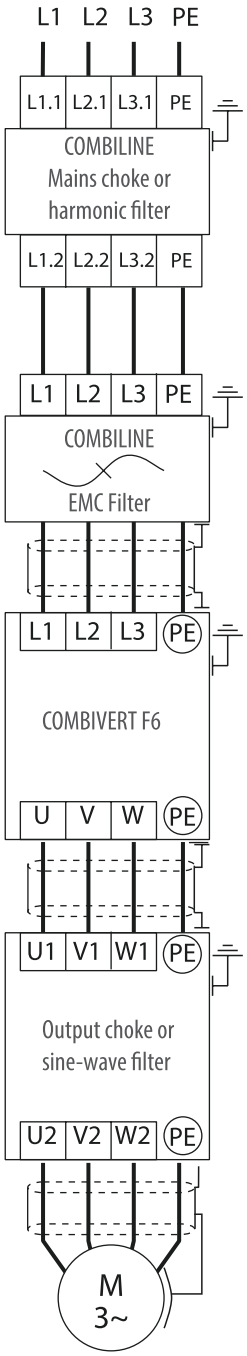


HIGHLIGHTS

- IEC 61131-3 Applications development
- Device and library database
- Product configuration
- Start-up and diagnosis assistant
- COMBIVIS studio HMI integration
- Document database

STABLE OPERATION IN INDUSTRIAL ENVIRONMENT

An EMC-compliant assembly with efficient control cabinet and suppression system is the basis for safe operation of machinery and equipment. The current and voltage limiting COMBILINE modules are optimally designed to meet the requirements of the COMBIVERT F6 drive controller series and support the use through:



MAINS EMC FILTERS
Reduce the cable-fed emission to the required limits IEC 61800-3 - C1/C2. Further variants offer low leakage currents or the operation of special mains networks, additionally available as submounted filter for COMBIVERT F6.

MAINS CHOKE
Reduce the input peak current draw and the mains distortion. By smoothing the input current draw, the lifetime of the drive is enhanced, in particular at constantly high utilization.

OUTPUT CHOKES AND FILTERS
Reduce the voltage and current stress of the motor winding.

INPUT / OUTPUT COMBI FILTERS
Space-saving combination, consistently adapted and optimised to the drive controller.

SINE-WAVE FILTERS
Protect the motor winding from voltage peaks and allow the use of long motor cables.

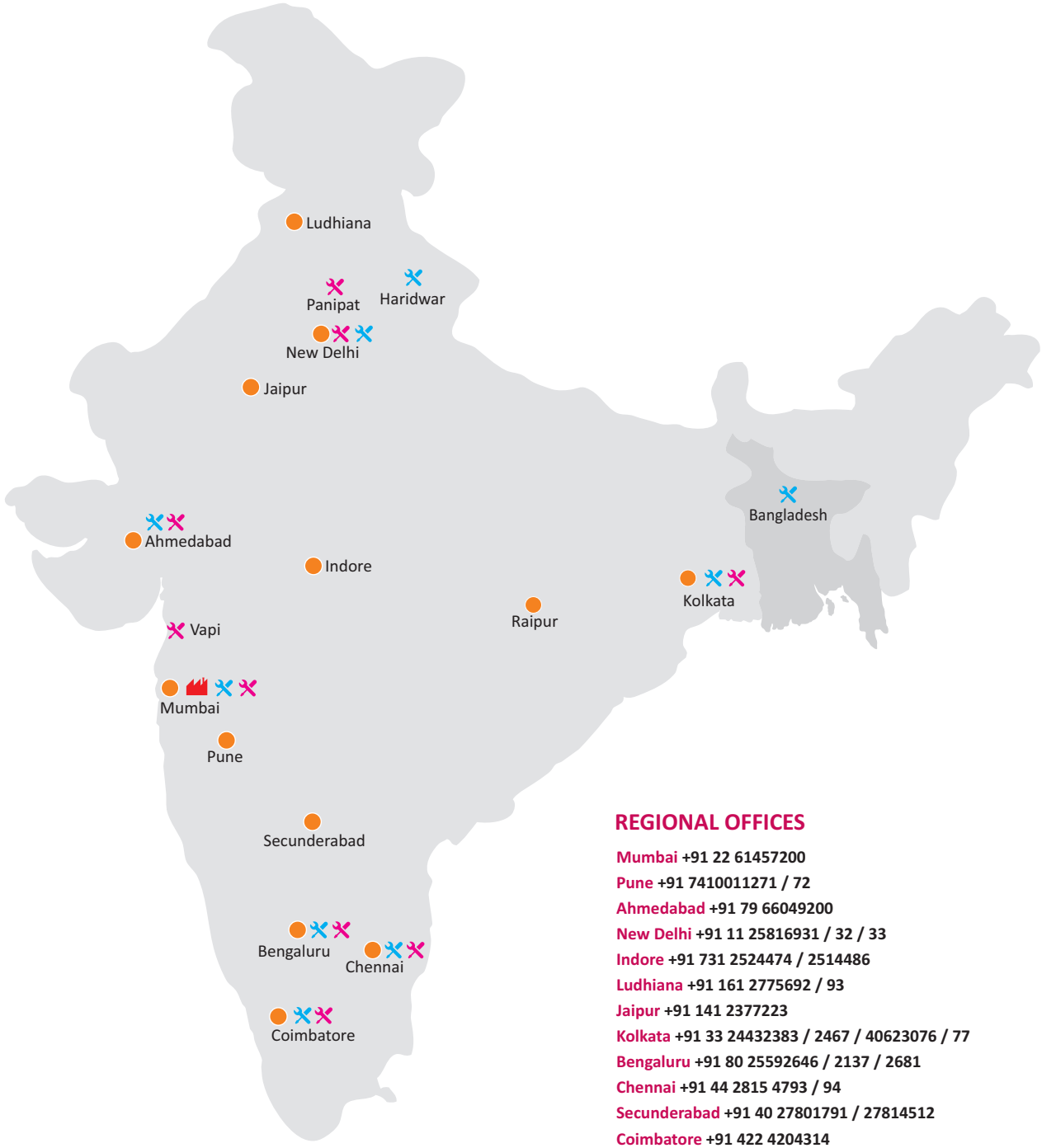
HARMONIC FILTERS
Reduce the low frequency mains distortion of B6-rectifier supplied devices. These harmonic filters are the innovative solution to comply to most international standards. The integration to a switch gear layout is as simple as of mains chokes.

SINE-WAVE EMC FILTERS
Allow operation of motors with long motor cables even without screening.

HIGH PERFOMANCE FERRITE CORES
Reduces the values of du/dts also in the frequency range of the bearing currents.

ALL INDIA SERVICE NETWORK

- Regional Offices
- Works
- Service Centre: Drives
- Service Centre: Servo Motors



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