



# TA-BL/P

Digital IGBT Drive for Brushless DC-Motors

**4kW - 360kW**

**5HP - 500HP**

Digital



# HIGHLIGHTS

## THE CONTROLLER

- Very high efficiency using our special control methods
- Above average power factor  $\lambda \approx 0.95$
- Worldwide voltage range without transformers  
200 - 250V  $\pm 10\%$  at 50/60 Hz or 350 - 480V  $\pm 10\%$  at 50/60 Hz
- No line choke necessary, standard DC choke for noise reduction
- Optional internal filter for CE compliance
- State of the art IGBT technology
- Best out of the box performance vs. AC vector drives
- Standard RS422 or RS485 multidrop communication
- Optional communication modules for Profibus-DP, Interbus-S and CAN-Bus
- Simple installation and startup with optional handheld keypad or Drive Administrator software (Win95/98/NT compatible)
- Quick startups and excellent performance with our matched motor/drive packages
- Conservative sizing of capacitors and semiconductors ensuring long life
- Regardless of motor cable length, no output chokes are required

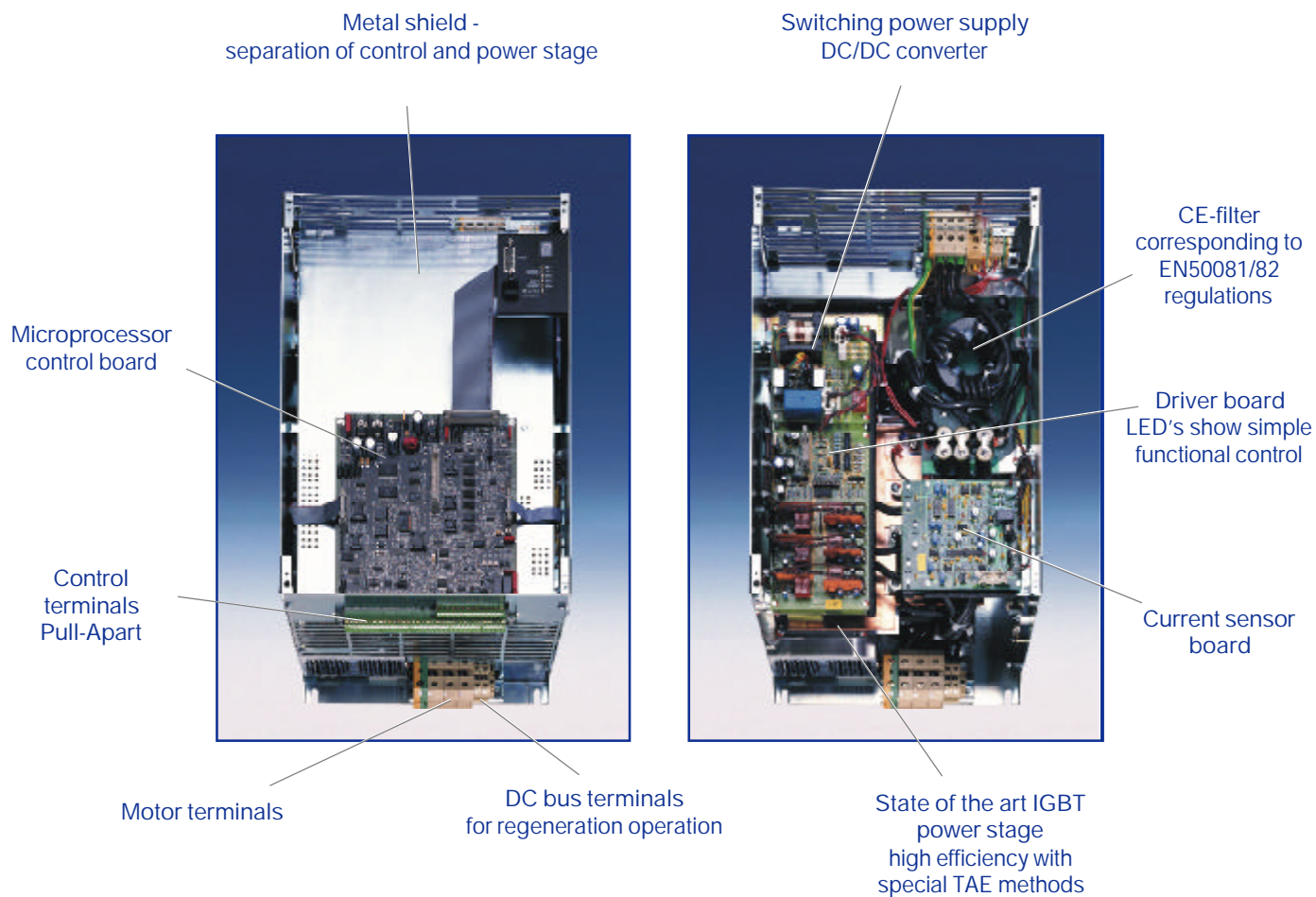
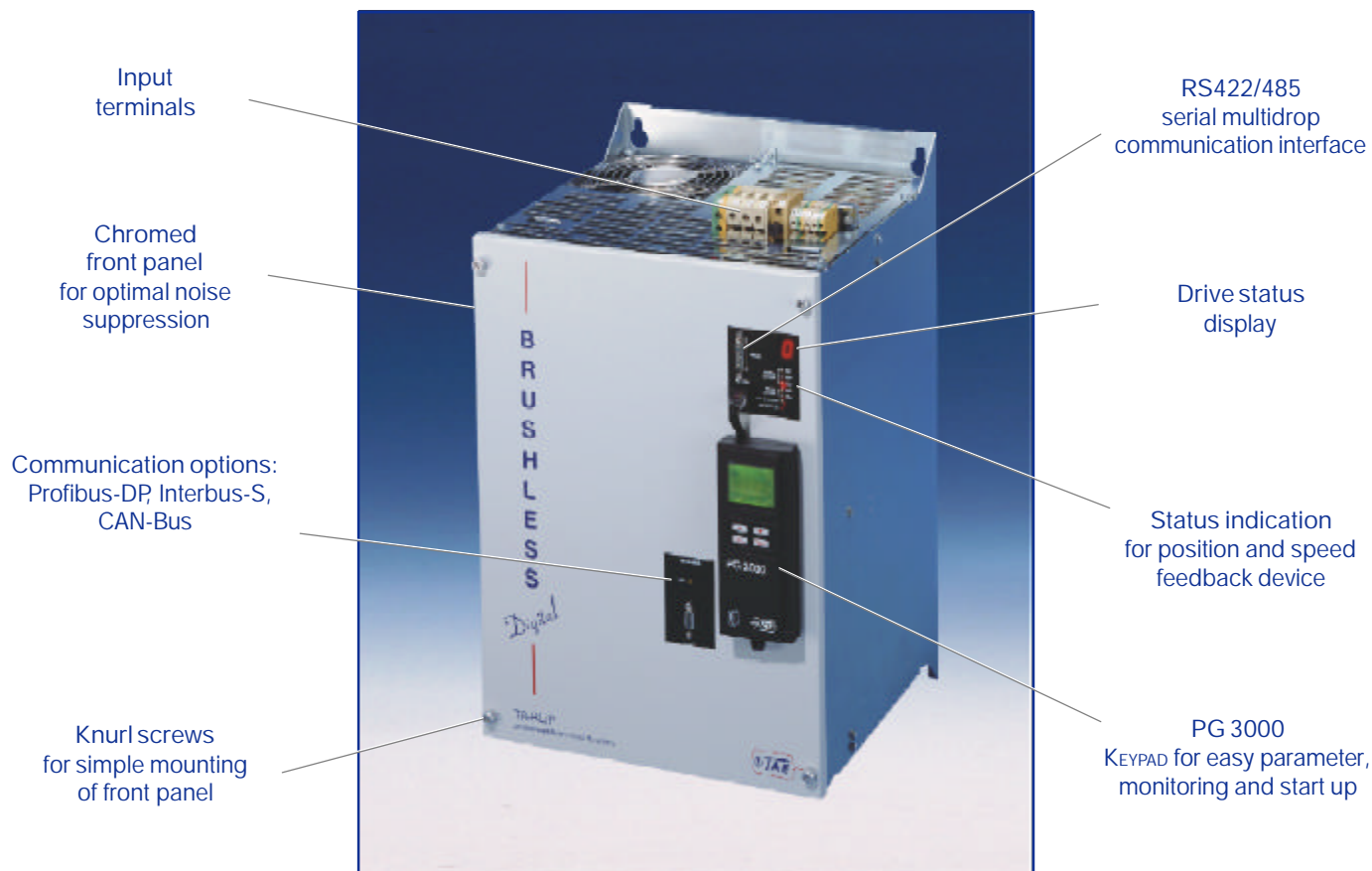
## THE BRUSHLESS DC-MOTOR

- Brushless maintenance-free motor, no wearing parts
- Enclosure IP23 to IP65 available (DPFG, DPBV, TENV, TEFC and TEAO)
- Permanent magnets ensure the best efficiency and highest power density
- Very linear current/torque curve, similar to shunt-wound DC motors
- Quiet operation
- Full torque at zero speed, indefinitely
- MUCH smaller frame sizes vs. conventional AC motors of the same power
- High dynamic low moment of inertia

*TAE is proud to offer more than 20 years experience providing quality products and reliable service*



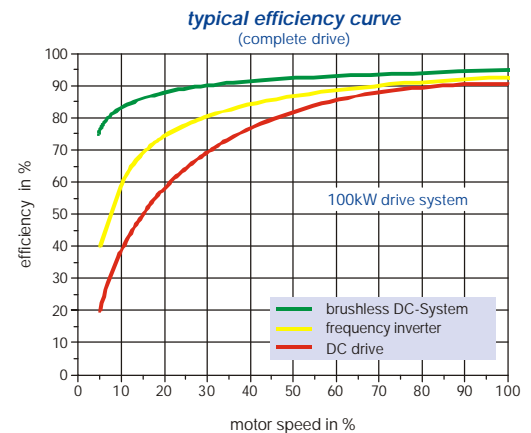
Brushless DC motor



# DRIVES COMPARISON

## THE EFFICIENCY

- The brushless DC drive system operates with outstanding efficiency over the complete speed and load range.
- At rated speed and load, the brushless DC drive produces 20%...50% less loss (2%...6% better efficiency) than comparable DC drives or frequency inverters.
- At lower speeds the energy savings increase up to 80%.
- Typical values for the efficiency of the brushless DC systems: 5HP  $\Rightarrow$  85%; 30HP  $\Rightarrow$  89,5%; 135HP  $\Rightarrow$  95%



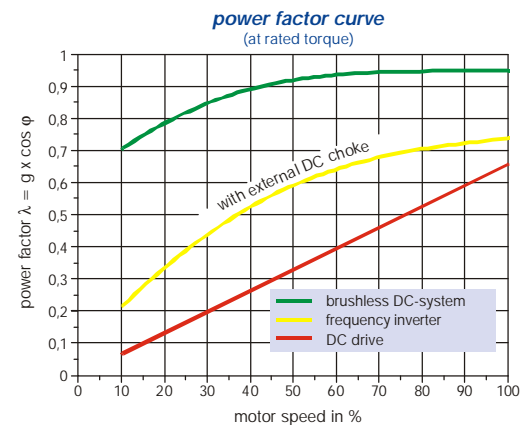
## THE POWERFACTOR

- The powerfactor  $\lambda$  denotes the drives  $\cos(\varphi)$  at AC input, which also takes the current harmonics into account.

$$\lambda = g \times \cos(\varphi) = \frac{I_1}{\sqrt{I_1^2 + I_3^2 + I_5^2 + \dots + I_n^2}} \times \cos(\varphi)$$

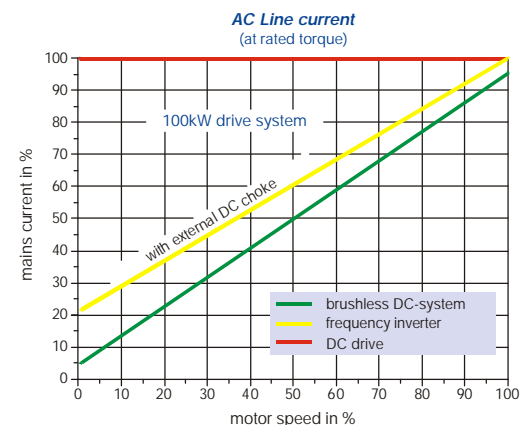
$I_1$  = RMS value of fundamental  
 $I_n$  = RMS value of n. harmonics

- Our TA-BL/P drives generate much lower harmonics than DC or frequency drives do.
- No external compensation devices are necessary to minimize reactive power consumption.

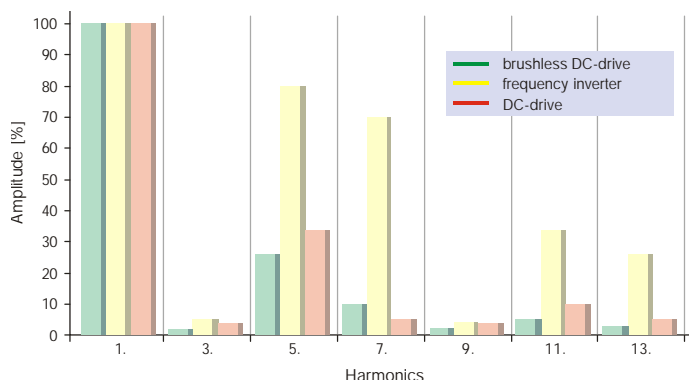


## THE LINE CURRENT

- The special design of our TA-BL/P drives reduce AC line current considerably.



Fundamental and harmonics of current



- The bar graph shows the typical line currents of the fundamental and the harmonics.

It is clearly visible, that our TA-BL/P system generates currents with lower harmonics than DC or frequency inverter drives do. This minimizes interactions with other devices, which are supplied by the same AC Line distribution system.

# COSTS SAVINGS BY USING BRUSHLESS DC DRIVES

## ENERGY SAVINGS

- Very high efficiencies in both motor and drive in comparison to DC drives and frequency inverters.
- Low reactive power consumption by very high power factor.

## SAVINGS BY USING LESS COMPLEX DRIVES

- Two standard internal DC-chokes replace optional external line chokes.
- Reactive current compensation devices are not necessary.
- Complete CE compliance with optional filters which are integrated in the TA-BL/P drives.
- Smaller cables can be used between AC supply and TA-BL/P drives.
- Components like control-, driver-, current sensor-board and switching power supply are the same for all drive sizes.

## SHORT START-UP PERIODS

- Structured division of all parameters in groups allows intuitive programming.
- With the short start up periods, downtime and resource requirements are reduced.
- Optimized drive-motor packages shorten start up periods

## PERFORMANCE COMPARISON CHART

- The following chart shows the different performance properties of our brushless DC drives in comparison to frequency inverters (open loop) and DC drives.

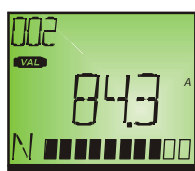
|                          | brushless DC-system           | frequency inverter   | DC drive                                    |
|--------------------------|-------------------------------|--|---|
| maintenance free         | yes                           | yes  | no  |
| high load at low speed   | yes                           | conditional<br>(only with speed feedback and<br>a constant speed blower) | yes   |
| torque control           | yes                           | no   | yes   |
| break away torque        | excellent                     | satisfactory   | good<br>(problems with commutator)          |
| operation at rated speed | very efficient                | good   | good<br>(wear out of brushes)               |
| speed regulation         | excellent<br>(Standard 0,03%) | satisfactory   | good<br>(1% only with speedfeedback device) |
| Speed- / torquecontrol   | excellent                     | poor   | excellent                                   |
| start up                 | very easy                     | costly   | simple                                      |

# OPERATION AND COMMUNICATION

## KEYPAD PG3000 - THE MULTIFUNCTIONAL HMI

The multifunctional KEYPAD PG3000 allows simple access to all drive functions and gives the user a good view of drive status during operation.

- Display of actual values e.g. motor current, motor speed, line speed
- Display and setting of all parameters with English descriptions
- Control of the drive and reference speed during start up
- Good visible change of the display color from green to red in case of a drive fault
- Password protection against unauthorized access
- Read- / Write unit for SMARTCARD integrated into PG 3000
- Backup of all parameters safe and inexpensive with the SMARTCARD
- Duplication of parameter settings from one drive to another without PC



### VAL Display of actual values

The display is able to show two independent current values. One can be shown numerically and the other graphically.

Example: Numerical display of the motor Amps and graphical display of the RPM by the bargraph.



### CTRL Control of the drive and set of the reference value

This mode allows to control the drive by the KEYPAD. All common control orders e.g. start, stop, direction and setting of the reference value are available.

Example: Numerical display of the reference value by the KEYPAD in RPM, numerical display of the current motor speed in % (on the top left) and graphically display of the motor current by the bargraph.



### PARA Parameter setting

This mode allows simple editing of all drive settings. A good overview about all parameters is guaranteed by showing the parameter group, parameter number and the parameter-short description.

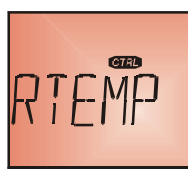
Example: display of the parameter *MAX5* (max. speed), group1, parameter # 02



### CARD SMARTCARD

The accurate and reliable Backup of all parameter settings is possible by the SMARTCARD

Example: writing a parameter-setting on the SMARTCARD



### Fault messages

In the case of a fault, the display color changes from green to red and the detected fault is displayed with a short text.

Example: *RTEMP* shows a over-temperature fault of the drive.

## FAST DATA RECOVERY

With every drive we deliver a SMARTCARD with all customer specific configurations. After programming errors or after exchange of the control board a fast recovery of all parameter settings is guaranteed.

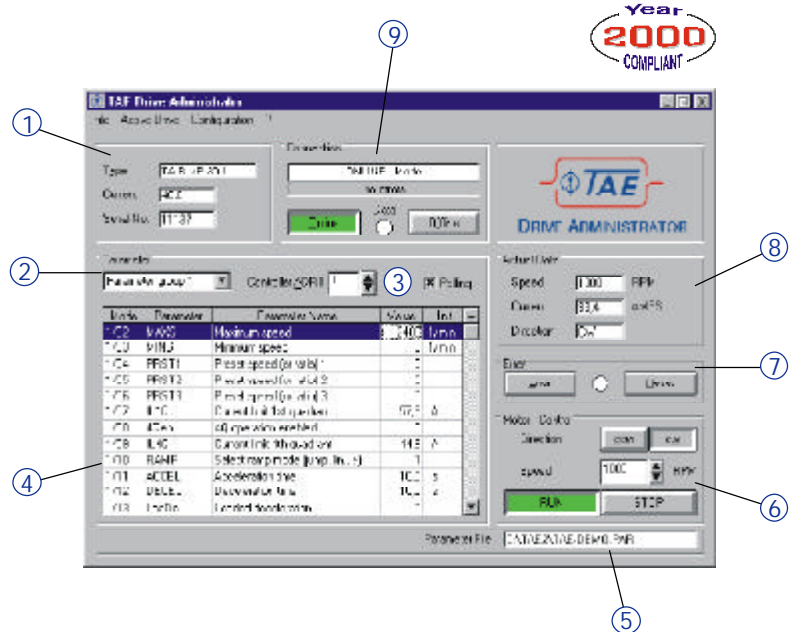


# OPERATION AND COMMUNICATION

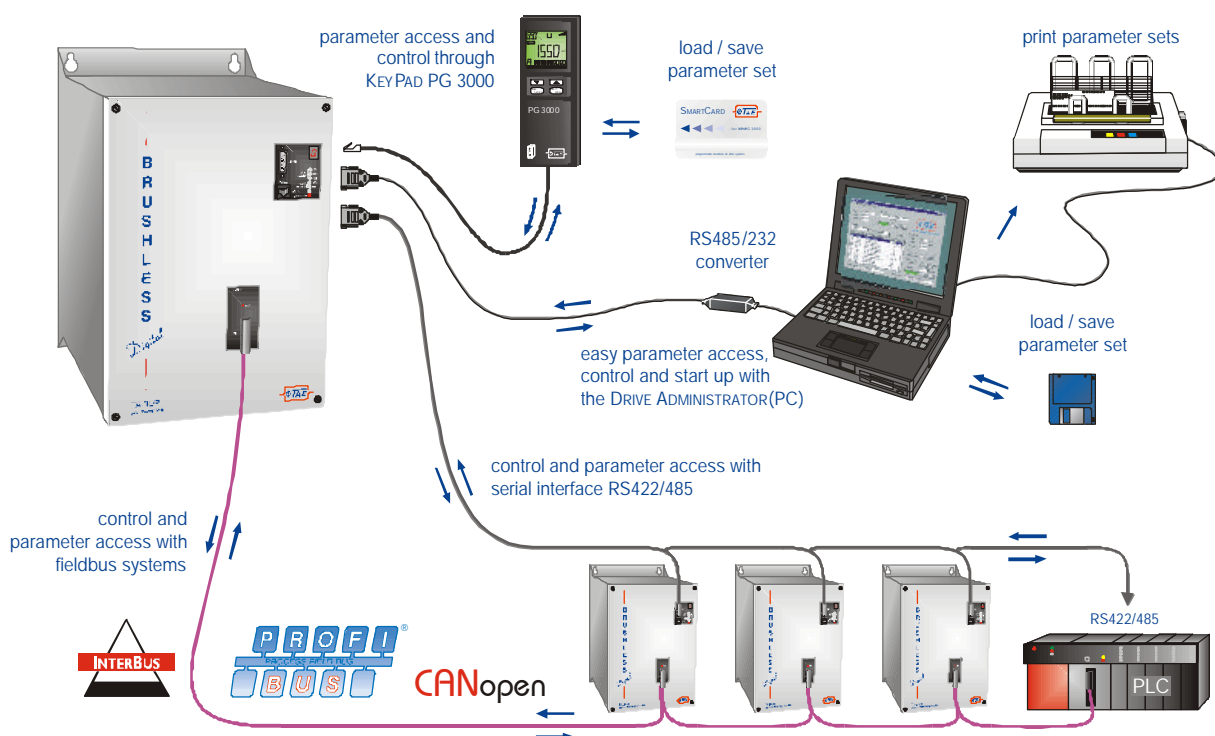
## THE TAE DRIVE ADMINISTRATOR

The TAE Drive Administrator software is easy to use, designed to run with Windows 3.1 / 95 / NT and 98. The language can be chosen between English and German. All Parameters can be stored in data memory and used in other applications. Furthermore, Drive Administrator supports the print out of all parameters for easy documentation. A simple-to-use help function supports the user with easy to understand text. If a drive is connected, the Drive Administrator also can be used to control the drive. With the Off-line mode, parameter sets can be set at your desk.

- ① nameplate data of the connected TA-BL/P drive
- ② choice of one parameter group
- ③ choice of a node number, when using more than one TA-BL/P drive with RS422/485 multidrop
- ④ parameter name, editing of parameters during ON- or OFF-line
- ⑤ selected parameter file
- ⑥ drive control and reference speed limit
- ⑦ fault display with a detailed description and reset
- ⑧ display of current values
- ⑨ communication-/status display



## THE TA-BL/P COMMUNICATION POSSIBILITIES



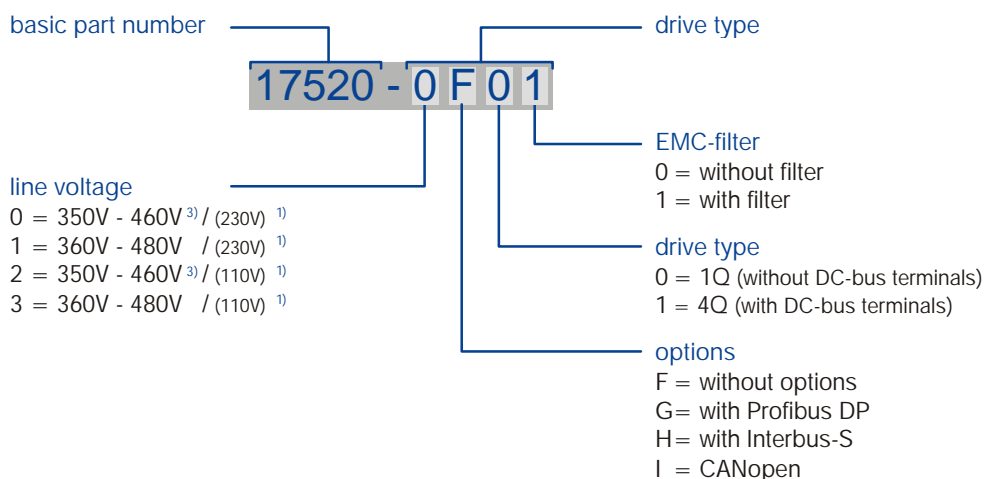
# DRIVE OVERVIEW

|  | mains   |            | maximum power |          | Drive  | efficiency by 400V |        | output current (I) |            |              |
|--|---------|------------|---------------|----------|--------|--------------------|--------|--------------------|------------|--------------|
|  | voltage | current    | output        |          | losses | drive              | system | I-rated            | I-peak     | I-switch off |
| <b>TA-BL/P 4.1</b><br>17050-xxxx                 | 400V    | 8,2 A      | 4,6 kW        | 6,3 HP   | 160 W  | 96,8 %             | 85,5 % | 13,0 A             | 22,0 A     | 29,0 A       |
|  | 480V    |            | 5,7 kW        | 7,8 HP   |        |                    |        |                    |            |              |
| <b>TA-BL/P 6.1</b><br>17070-xxxx                 | 400V    | 12,2 A     | 6,2 kW        | 8,4 HP   | 200 W  | 97,0 %             | 86,2 % | 17,0 A             | 28,0 A     | 34,0 A       |
|  | 480V    |            | 7,4 kW        | 10,0 HP  |        |                    |        |                    |            |              |
| <b>TA-BL/P 8.1</b><br>17090-xxxx                 | 400V    | 16,5 A     | 9,4 kW        | 12,8 HP  | 280 W  | 97,1 %             | 86,5 % | 27,0 A             | 42,0 A     | 54,0 A       |
|  | 480V    |            | 11,3 kW       | 15,4 HP  |        |                    |        |                    |            |              |
| <b>TA-BL/P 10.1</b><br>17110-xxxx                | 400V    | 23,5 A     | 14,0 kW       | 19,0 HP  | 420 W  | 97,2 %             | 87,5 % | 40,0 A             | 68,0 A     | 82,0 A       |
|  | 480V    |            | 16,8 kW       | 23,0 HP  |        |                    |        |                    |            |              |
| <b>TA-BL/P 15.1</b><br>17160-xxxx                | 400V    | 34,0 A     | 20,0 kW       | 27,0 HP  | 570 W  | 97,2 %             | 88,5 % | 58,0 A             | 91,0 A     | 120,0 A      |
|  | 480V    |            | 24,0 kW       | 33,0 HP  |        |                    |        |                    |            |              |
| <b>TA-BL/P 20.1</b><br>17220-xxxx                | 400V    | 43,3 A     | 26,0 kW       | 35,0 HP  | 720 W  | 97,3 %             | 89,6 % | 75,0 A             | 135,0 A    | 170,0 A      |
|  | 480V    |            | 31,0 kW       | 42,0 HP  |        |                    |        |                    |            |              |
| <b>TA-BL/P 30.1</b> <sup>1)</sup><br>17320-xxxx  | 400V    | 60,5 A     | 35,0 kW       | 48,0 HP  | 890 W  | 97,5 %             | 90,2 % | 100,0 A            | 175,0 A    | 210,0 A      |
|  | 480V    |            | 42,0 kW       | 57,0 HP  |        |                    |        |                    |            |              |
| <b>TA-BL/P 50.1</b> <sup>1)</sup><br>17520-xxxx  | 400V    | 95,0 A     | 59,0 kW       | 80,0 HP  | 1360 W | 97,7 %             | 91,3 % | 170,0 A            | 260,0 A    | 320,0 A      |
|  | 480V    |            | 70,0 kW       | 95,0 HP  |        |                    |        |                    |            |              |
| <b>TA-BL/P 60.1</b> <sup>1)</sup><br>17620-xxxx  | 400V    | 115,0 A    | 67,0 kW       | 91,0 HP  | 1480 W | 97,8 %             | 92,2 % | 190,0 A            | 340,0 A    | 410,0 A      |
|  | 480V    |            | 80,0 kW       | 110,0 HP |        |                    |        |                    |            |              |
| <b>TA-BL/P 80.1</b> <sup>1)</sup><br>17820-xxxx  | 400V    | 155,0 A    | 96,0 kW       | 130,0 HP | 2200 W | 97,8 %             | 94,8 % | 280,0 A            | 510,0 A    | 560,0 A      |
|  | 480V    |            | 115,0 kW      | 156,0 HP |        |                    |        |                    |            |              |
| <b>TA-BL/P 100.1</b> <sup>1)</sup><br>17910-xxxx | 400V    | 176,0 A    | 110,0 kW      | 150,0 HP | 2500 W | 97,8 %             | 94,9 % | 330,0 A            | 510,0 A    | 560,0 A      |
|  | 480V    |            | 132,0 kW      | 180,0 HP |        |                    |        |                    |            |              |
| <b>TA-BL/P 150.1</b> <sup>1)</sup><br>17930-xxxx | 400V    | 240,0 A    | 150,0 kW      | 205,0 HP | 3100 W | 98,0 %             | 95,0 % | 440,0 A            | 700,0 A    | 840,0 A      |
|  | 480V    |            | 180,0 kW      | 245,0 HP |        |                    |        |                    |            |              |
| <b>TA-BL/P 150.1</b> <sup>2)</sup><br>17940-xxxx | 400V    | 2x 145,0 A | 180,0 kW      | 245,0 HP | 4000 W | 97,8 %             | 94,8 % | 2x 270,0 A         | 2x 510,0 A | 2x 560,0 A   |
|  | 480V    |            | 216,0 kW      | 295,0 HP |        |                    |        |                    |            |              |
| <b>TA-BL/P 200.1</b> <sup>2)</sup><br>17950-xxxx | 400V    | 2x 176,0 A | 210,0 kW      | 285,0 HP | 4700 W | 97,8 %             | 94,9 % | 2x 320,0 A         | 2x 510,0 A | 2x 560,0 A   |
|  | 480V    |            | 240,0 kW      | 325,0 HP |        |                    |        |                    |            |              |
| <b>TA-BL/P 300.1</b> <sup>2)</sup><br>17970-xxxx | 400V    | 2x 240,0 A | 300,0 kW      | 400,0 HP | 6300 W | 98,0 %             | 95,0 % | 2x 440,0 A         | 2x 700,0 A | 2x 840,0 A   |
|  | 480V    |            | 360,0 kW      | 490,0 HP |        |                    |        |                    |            |              |

<sup>1)</sup> Drives from TA-BL/P to TA-BL/P 150.1 need an external control voltage of 230V AC (other control voltages on demand)

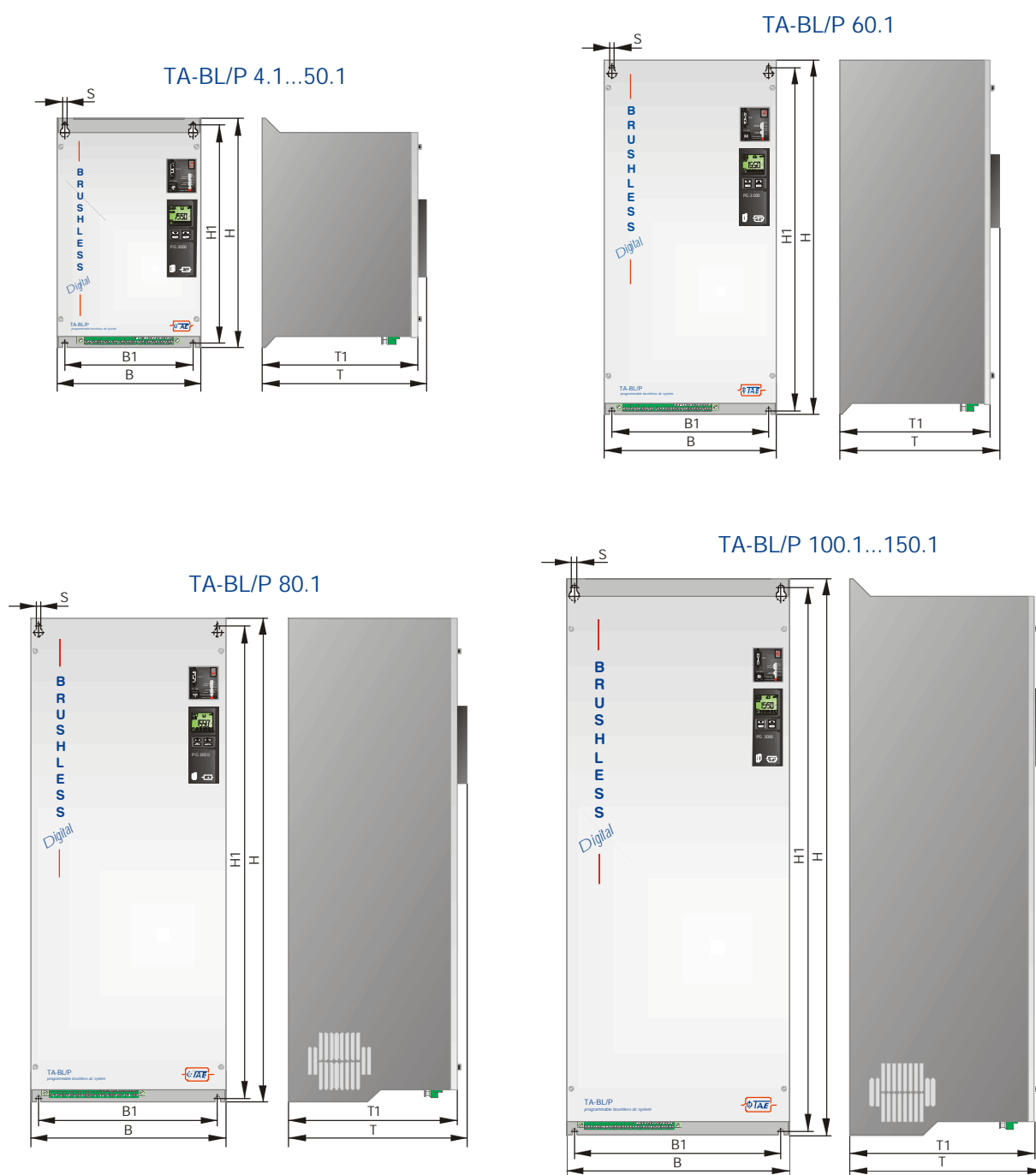
<sup>2)</sup> Drives TA-BL/P 180.1 and up use two parallel wired power stages, ready to connect, mounted in an IP54 cabinet.

<sup>3)</sup> Drives ordered with EMC-filter have a rated input voltage range of 350-420V





# DIMENSIONS





dimensions TA-BL/P ...

|    | 4.1 / 6.1 | 8.1 / 10.1 | 15.1 | 20.1 / 30.1 | 50.1 | 60.1 | 80.1 | 100.1 | 150.1 |
|----|-----------|------------|------|-------------|------|------|------|-------|-------|
| B  | 211       | 228        | 278  | 307         | 367  | 367  | 415  | 440   | 698   |
| B1 | 182       | 198        | 245  | 275         | 337  | 337  | 381  | 406   | 660   |
| H  | 290       | 305        | 385  | 500         | 645  | 750  | 1000 | 1100  | 980   |
| H1 | 271       | 285        | 365  | 470         | 627  | 727  | 970  | 1070  | 955   |
| T  | 301       | 355        | 320  | 320         | 350  | 350  | 369  | 389   | 399   |
| T1 | 277       | 331        | 296  | 296         | 326  | 326  | 345  | 365   | 375   |
| S  | 7         | 7          | 9    | 9           | 9    | 9    | 12   | 12    | 12    |

| drive type                            | width | height | depth |
|---------------------------------------|-------|--------|-------|
| TA-BL/P 180.1 (design switch cabinet) | 1200  | 2000   | 600   |
| TA-BL/P 200.1 (design switch cabinet) | 1600  | 2000   | 600   |
| TA-BL/P 300.1 (design switch cabinet) | 2000  | 2000   | 600   |

all dimensions in millimeters

# TECHNICAL DATA

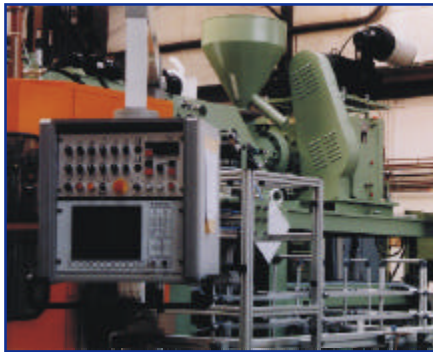
|  |   |  |
|--|---|--|
| environment  | 0-40°C ( 32-104°F ), less than 90% humidity, non- condensing, less than 1000m (3300 feet) above sealevel  |  |
| enclosure  | IP20 / NEMA type 1  |  |
| line voltage   | 200-250V, 350-460V <sup>*)</sup> or 360-480V, ±10%, 3 phases, 50/60Hz<br><sup>*) drives ordered with EMC-filter have a rated input voltage range at 350-420V</sup>  |  |
| control voltage<br>(for charge contactor and blower) | 230V or 110V, ±10%, 1 phase, 50/60Hz<br>(only used with drives from TA-BL/P 30.1 to TA-BL/P 150.1)  |  |
| modulation method                                    | PWM trapezoidal-commutation   |  |
| operation mode                                       | <ul style="list-style-type: none"> <li>• 1- Quadrant (motoring)</li> <li>• 4- Quadrant (regen)</li> <li>• Servo</li> </ul>  |  |
| switching frequency                                  | 300Hz to 18kHz (up to 4.5kHz without derating)  |  |
| coordinated operation                                | <ul style="list-style-type: none"> <li>• Master / follower</li> <li>• electronic gearing - synchronous operation (digital lock)</li> </ul>  |  |
| control accuracy                                     | <ul style="list-style-type: none"> <li>• digital reference 0.01%</li> <li>• analog reference 0.1%</li> <li>• Master / follower ± 1 digit</li> </ul>   |  |
| speedramp generator                                  | <ul style="list-style-type: none"> <li>• acceleration and deceleration time 0.0 - 599.9s</li> <li>• 2 ramps, internal or external selectable</li> <li>• curve shape: linear, S-curve, no ramp(step)</li> </ul>  |  |
| speed reference                                      | <ul style="list-style-type: none"> <li>• analog 0-10V, ±10V or 0(4) - 20 mA</li> <li>• digital with impulse input</li> <li>• 3 preset speeds</li> <li>• KeYPAD PG3000, communication network, (RS485, Profibus-DP, Interbus-S, CAN-Bus)</li> <li>• electronic motor operated pot</li> </ul>                                 |  |
| torque reference                                     | <ul style="list-style-type: none"> <li>• analog 0-10V or via communication network</li> </ul>   |  |
| current output                                       | 0-5V $\hat{=}$ 0 - rated current (could be scaled customer specific)  |  |
| analog output  | ± 10V, selectable as speed or current output  |  |
| digital inputs                                       | 12 free programmable, insulated inputs, 24V DC <ul style="list-style-type: none"> <li>• reset</li> <li>• reference value from motor pot on/off</li> <li>• master / follower operation</li> <li>• positioning</li> <li>• increasing / decreasing speed during master / follower operation</li> <li>• limit switch</li> </ul> | <ul style="list-style-type: none"> <li>• start forward, start reverse</li> <li>• motor pot faster / slower</li> <li>• synchronous operation (digital lock)</li> <li>• angle correction</li> <li>• select between 3 preset speeds and analog reference</li> <li>• speed ramp selection</li> </ul> |
| digital outputs                                      | 2 relays and 3 digital outputs <ul style="list-style-type: none"> <li>• fault</li> <li>• operation</li> <li>• DC overvoltage</li> <li>• current limit reached with selectable delay</li> </ul>  | <ul style="list-style-type: none"> <li>• ready</li> <li>• speed greater than 9 rpm</li> <li>• short circuited IGBT</li> <li>• at speed</li> </ul>  |
| standards  |     |  |

# APPLICATIONS

## Extrusionsanlagen

Extruder stellen hohe Ansprüche an das Antriebssystem. Durch die vorteilhafte Charakteristik des bürstenlosen Gleichstromsystems stehen beim Kaltstart hohe Anlaufmomente zur Verfügung. Im Betrieb gewährleistet der hohe Drehzahlstellbereich auch bei kleinen Drehzahlen gute Rundlaufeigenschaften. Hierdurch wird eine kontinuierliche Produktqualität erreicht. Weiter werden die Betriebskosten durch den wartungsfreien Aufbau aller Komponenten und den geringen Energiebedarf des Antriebssystems reduziert.

Die bürstenlosen Gleichstromantriebe von TAE sind bereits im Einsatz in Folienextrudern, Plattenextrudern, Extrudern für Blasformmaschinen, Extudern für die Lebensmittelindustrie sowie in Co-Extrudern.



Blasformmaschine zur Herstellung von Kunststoffbehältern.

Co-Extruder im Einsatz an einer Extrusionsanlage zur Herstellung mehrschichtiger Tubenschläuche



## Wickler

Wickelantriebe benötigen neben einem großen Drehzahlstellbereich gute dynamische Eigenschaften und eine konstante Momentenverfügbarkeit über den gesamten Drehzahlbereich, um den gewünschten Materialzug gewährleisten zu können. Hierbei unterstützen unsere Antriebe sowohl Tänzer- als auch Drehmomentregelung, unabhängig davon, ob es sich um Zentrums- oder Umfangswickler handelt. Bei Bedarf kann die Durchmesserberechnung im TA-BL/P Regelgerät erfolgen.

## Materiallogistik

Moderne Materiallogistik wird durch dynamisch arbeitende Antriebe mit einer hohen Momentenverfügbarkeit bei kleinsten Drehzahlen oder gar bei Drehzahl Null erst ermöglicht. Ob bei Einsatz in einem elektrischen Fahr- oder Hubantrieb, bürstenlose Gleichstromantriebe überzeugen mit überdurchschnittlich guten Eigenschaften. Die volle Momentenverfügbarkeit bei Drehzahl Null ermöglicht es, Nennlasten zeitlich unbegrenzt in der Schwebe zu halten oder mit kleinsten Kriechgeschwindigkeiten zu verfahren. Durch das sanfte Anlaufverhalten der TAE BL-DC Antriebe wird die Mechanik geschont und die Lebensdauer der Maschine verlängert.



## Master- / Slaveantriebe

Durch die Struktur der TA-BL/P Regelgeräte können sehr leicht Antriebseinheiten realisiert werden, bei denen mehrere Slaveantriebe dem Masterantrieb folgen. Die Kopplung der Antriebe kann wahlweise mit einem veränderlichen Drehzahlverhältnis (elektronisches Getriebe bzw. Synchronlauf der Antriebe) oder einer Drehzahl- / Drehmomentenregelung erfolgen.

Typische Einsatzgebiete: Funktional verknüpfte Transportbänder, Tuben-Produktionslinien, Strickmaschinen, Streckmaschinen (Industriemangeln oder Drahtziehmaschinen), Raffmaschinen.

Master- / Slaveantriebe mit Synchronlauf und Drehmomentenlimitierung an einer Produktionsanlage für Dämmstoffplatten.



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<http://www.tae-antriebstechnik.de>

# Advantages

- ❶ low energy costs, by high efficiency
- ❷ generate less harmonics than convential AC/DC drives do
- ❸ maintenance-free and quiet operation
- ❹ full torque at zero speed
- ❺ speed regulation with torque limit
- ❻ simple installation and quick startup with our motor/drive packages
- ❼ TENV motors available for many applications
- ❽ fast response and low moment of inertia
- ❾ implementation of custom functions by request

## Drive of the future

The „brushless DC drive technology“ is considering the worldwide increasingly scarcity raw materials and the ecology situation the drive system of the future.

**Sales Representativ USA / North America**



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