

PA0076

**Step Motor Driver
User Manual**



JVL Industri Elektronik A/S

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1.1

Features



Type PA0076 is an advanced multifunction step motor driver that can be controlled either by step pulses from an external source or by the internal step generator.

The driver is characterised by an ability for controlling all the basic parameters from either the internal adjustments or from the external source. These adjustment covers - step resolution, speeds, acceleration, motor currents and more.

The Controllers can be supplied from either a AC supply or a DC supply. The supply is not critical and can be a simple low cost solution such as a transformer connected between the mains supply and PA0076. An internal switch mode power supply is producing 24VDC for external purposes. This supply can deliver a current up to 300mA which is more than enough for most applications which typically can be sensors or limit switches.

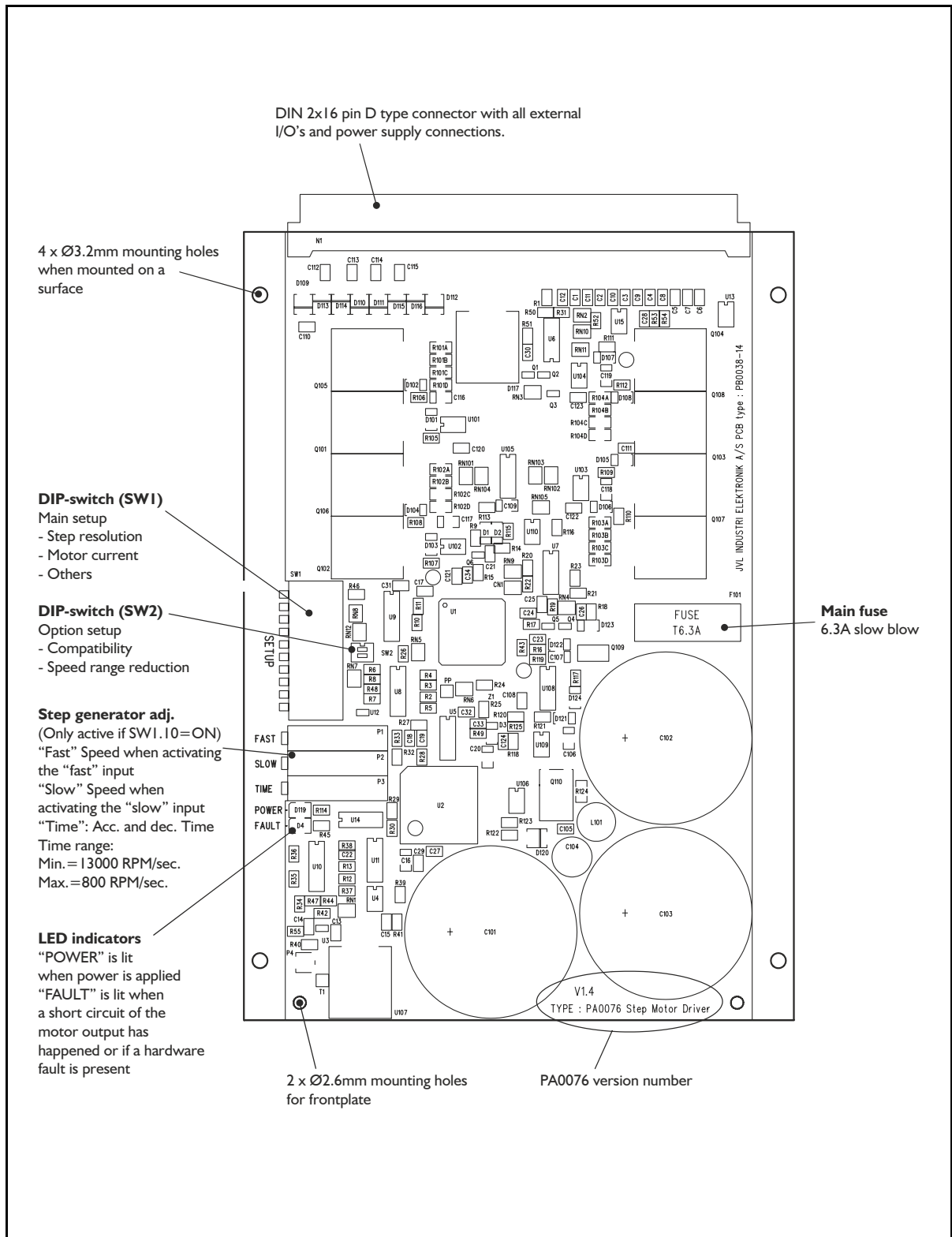
All user inputs and outputs are filtered which means that PA0076 will work properly also in an environment with a high level of electrical noise.

Main Features:

- Dimensions PA0076 = 112x160mm
PA0076-1 = 100x160mm
- Single supply
- Up to 4000 mini steps per revolution
- Controls either 2 or 4 phase step motors
- Noise filters at all input and outputs.
- Short-circuit and thermal-overload protection
- Stepfrequency up to 200 kHz.
- Adjustable standby current minimize motor temperature and increase life time.
- Standard DIN41612 type D connector
- Following input facilities:
 - Step and direction
 - Slow and fast speed adjustment
 - Slow and fast start/stop
 - Motor current adjustment
 - Energize input (enable)
- Following output facilities :
 - Zero phase output
 - Fault output
 - Step clock output
- 24VDC output - max 300mA
- Internal step generator with on-board adjustment of speed and velocities.
- Motor current up to 5A peak
- Can handle motors up to 6Nm
- Automatic current reduction in standby
- Power and Fault indicators on-board.
- High efficiency Mos-Fet power stage keeps temperature at a low level.

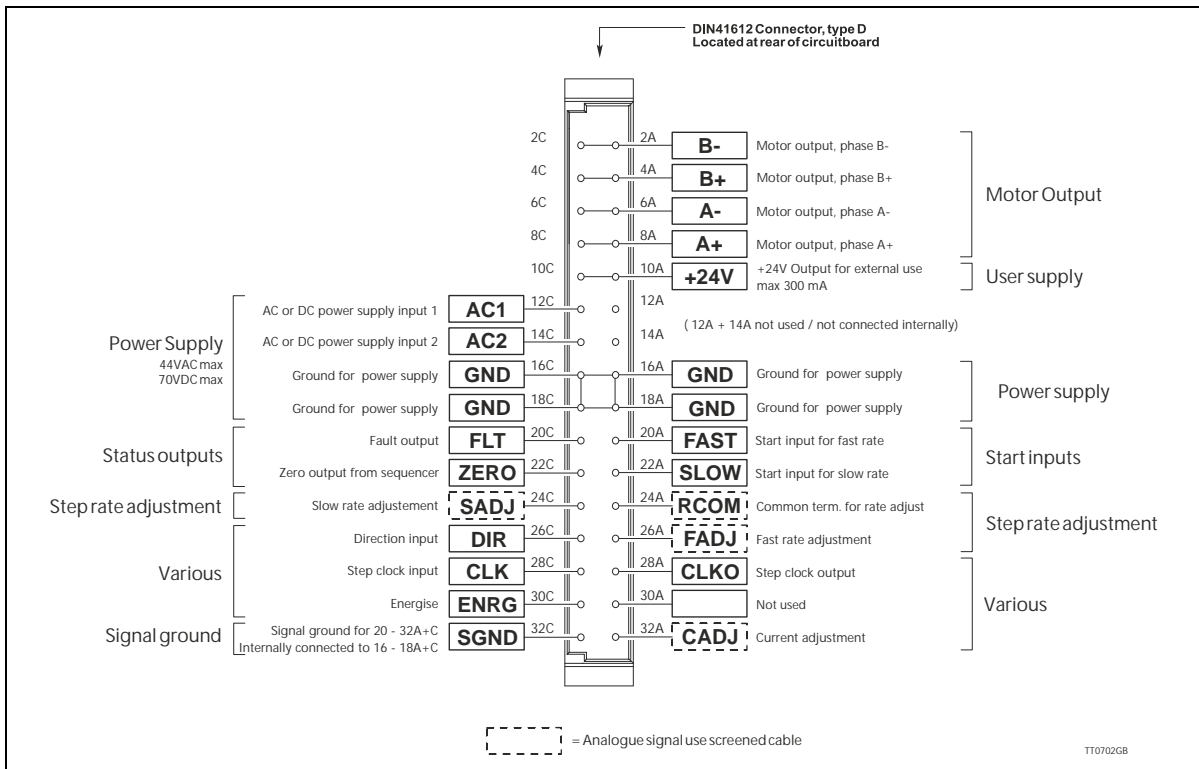
1.2

General board overview



1.3

Connector overview



1.3.1 A+ / A- / B+ / B- (Motor output)

Bipolar motor output for 2 or 4 phased stepper motors. The current can be set for 2 to 5A/phase through a dip-switch with steps of 0,5A.

The tolerance at the motor current is +/-5%.

The step resolution at the motor can also be set at the dip switch. The step resolution can be set at 200, 400, 1000, 2000 og 4000 step per revolution if a standard motor with 200 full step per revolution is used.

1.3.2 +24V (Supply output)

This terminal is intended for external purposes and can deliver up to 300mA. The output is protected against shortterm overloads (< 4 sec.).

1.3.3 AC1, AC2, GND (Main supply)

The main supply to the driver is connected at these terminals. If an AC-voltage is used as supply, this must be done by using a transformer with 2 windings. The common from the 2 windings must be connected to the GND terminals (16A/C and 18A/C). The 2 windings are connected to the AC1 and AC2 terminals. The voltage at AC1 and AC2 is thereby 180 degrees phaseshifted. If a DC voltage is used this can be connected with minus at the GND terminals and plus at the AC1 and AC2 terminals.

1.3.4 FLT (Fault output)

This terminal is an output which is used to indicate if the driver is functional or not.

The output is the NPN type and during normal operation it is active/closed (logic 0).

If an error occur the output is set passive whereby the terminal is three-stated.

1.3

Connector overview

1.3.5 ZERO (output)

The ZERO output indicates when the internal sequence electronic is in its zero position. The output is a NPN type and will be active (<1V) if the zero position is achieved. During the other steps the output is passive (floating). The output refers to the SGND terminal.

1.3.6 RCOM / SADJ / FADJ (Rate adj. common / Slow adj. / Fast adj.)

These terminals are used for adjusting the internal step generator.

The slow rate can be adjusted by a 100 kOhm potentiometer connected between the RCOM and the SADJ terminals. The slow rate can be adjusted in the range 30-1000 full steps per second.

The fast rate can be adjusted by a 10 kOhm potentiometer connected between the RCOM and the FADJ terminals. The fast rate can be adjusted in the range 600 - 20.000 full steps per second. The step generator can be started by an activating of either the FAST or SLOW input.

The tolerance at the step frequency (the step rate) is +/-2%. This tolerance only covers the internal functions in PA0076. If the speed is controlled by an external potentioniometer at the SADJ or FADJ inputs the tolerance will also depend at the quality of this.

Notice that an internal scale function will make sure that the speed at the motor always is the same regardless how the step resolution is adjusted (the number of steps per revolution).

1.3.7 DIR (Direction input)

The DIR input controls the direction of the motor rotation. The input must be controlled from a NPN output and must not be applied a voltage higher than 15V.

1.3.8 CLK (clock input)

If the internal step generator is not used external pulses is applied at this input. A single pulse is equal to 1 step. A single step can be 1/200 - 1/400 - 1/1000 - 1/2000 or 1/4000 of a revolution. This resolution is determined by the actual step resolution.

1.3.9 ENRG (Energise input)

This input is used to activate the motor output. If this input is not used, dip-switch no. 6 can be set in position ON whereby the driver is always active.

If the input is pulled to 0V the motor output is activated.

If the input is not connected (left open) the motor output is released whereby the motor is current less.

The input have to be controlled by a NPN output. The maximum allowable voltage at the input is 15V.

1.3.10 SGND (Signal ground)

Ground terminal which is used for all the digital inputs and outputs except RCOM, SADJ og FADJ which uses RCOM.

1.3.11 CLKO (Clock output)

This output produces a pulse every time the motor is moving a step. A step is either a full step or a ministep. The output is producing a step wheather the internal step generator is used or the external step input is used.

1.3 Connector overview

1.3.12 FAST / SLOW

These inputs can activate the internal step generator. If the FAST input is activated the step generator will start and accelerate to the step frequency adjusted at the internal or external FAST potentiometer.

If the SLOW input is activated the step generator will start and accelerate to the step frequency adjusted at the internal or external SLOW potentiometer. Dip-Switch no. 10 will determine whether the internal or external potentiometer will be used.

The CLK input must not be connected when the step generator is used.

The inputs is passive when not connected. An activation of either FAST or SLOW input means that the input terminal is connected to 0V (the SGND terminal). The inputs must therefore be controlled from a NPN output and the maximum voltage applied must be less than 15V.

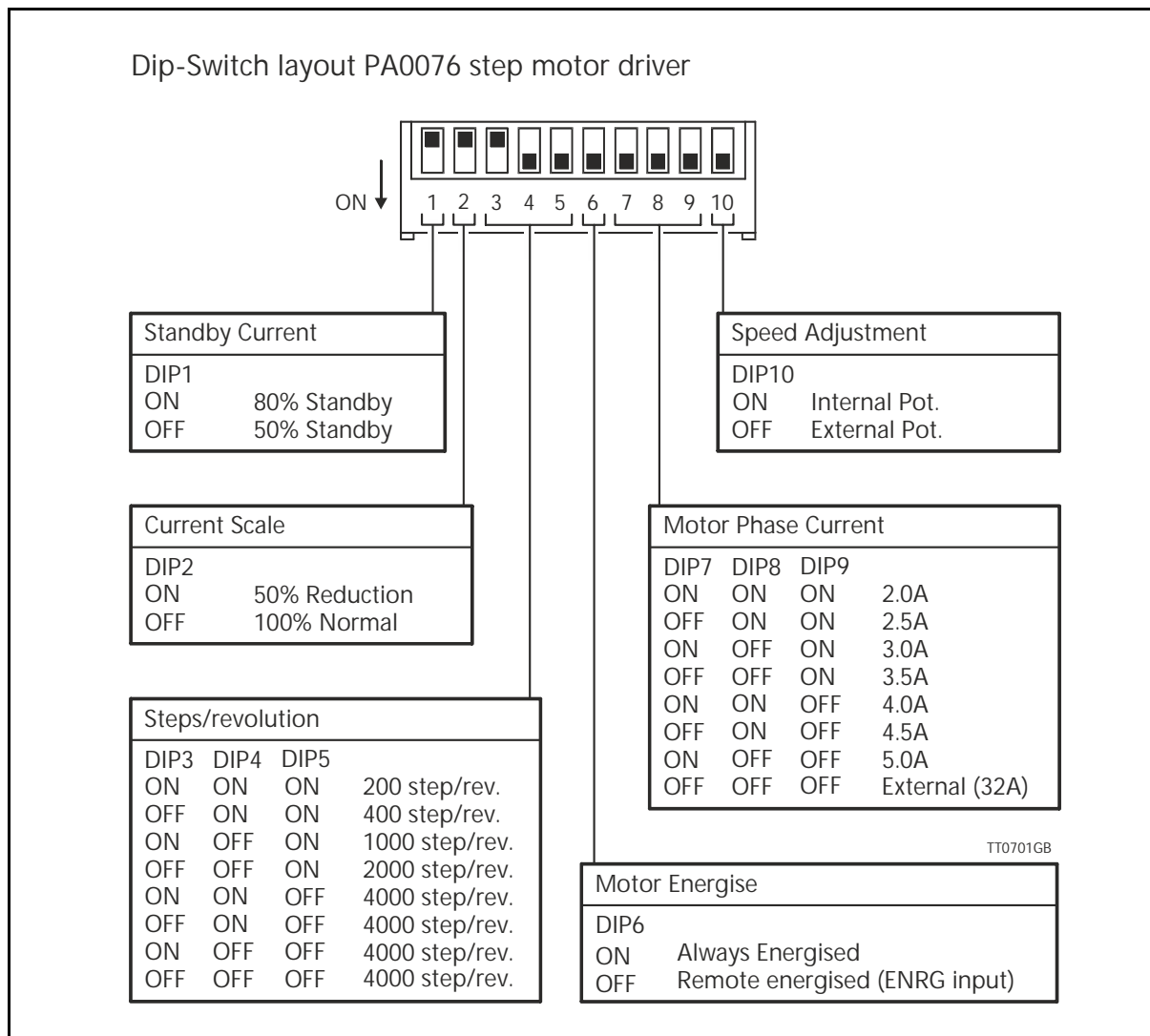
1.3.13 CADJ (Current adjustment)

The motor current can be adjusted at this terminal but only if dip-switch 6, 7 and 8 is set in the OFF position.

The current can be adjusted by connecting a resistor between the SGND and CADJ terminal.

1.4

Dipswitch settings



1.4.1 DIP1 - Standby Current

This switch controls the phase current for the motor when the motor is stationary. The absolute value of the current is determined by DIP7, 8 and 9. Also DIP2 has an influence since DIP2 in general is reducing the current to 50% of the value set by DIP7-9. DIP1 set in the ON position will decrease the motor current to 50% when the motor is stationary. If DIP1 is set in the OFF position this value will be 80%.

Example :

DIP7, 8 and 9 is set in a combination which will setup the full scale current to 5.0A.

DIP2 is set to OFF which means that it has no influence. DIP1 is set to OFF which means that the phase current for the motor will be 2.5A when the motor is stationary.

1.4.2 DIP2 - Current Scale

If small motors are used it can be convenient to reduce the motor current full scale. DIP2 set in position ON will reduce the current scale with 50%.

Example :

If DIP7, 8, and 9 is set to 5.0 A DIP2 set in position ON it will decrease this value to 2.5A. DIP2 also have an influence at the standby current (when motor is stationary).

1.4 Dipswitch settings

1.4.3 DIP3-5 - Steps/revolution

The step resolution can be adjusted with these switches.

The resolution can be set in the range 200 to 4000 steps/revolution based at a standard hybrid step motor with 200 full steps per revolution.

A standard rule is to set the step resolution to highest possible value since mechanical resonances is reduced to a minimum.

1.4.4 DIP6 - Motor Energise

The motor can be permanently energised if DIP6 is set in the ON position.

If DIP6 is set in the OFF position the input ENRG will determine wheather the motor should be energised or not. The ENRG input can typically be used to release the motor if it should be moved manually from its position.

1.4.5 DIP7-9 - Motor Phase Current.

The phase current for the motor can be set-up at these switches. The value specified is expressed as peak values during movement. When the motor is stationary the current will be decreased to 50% or 80% of the setup value.

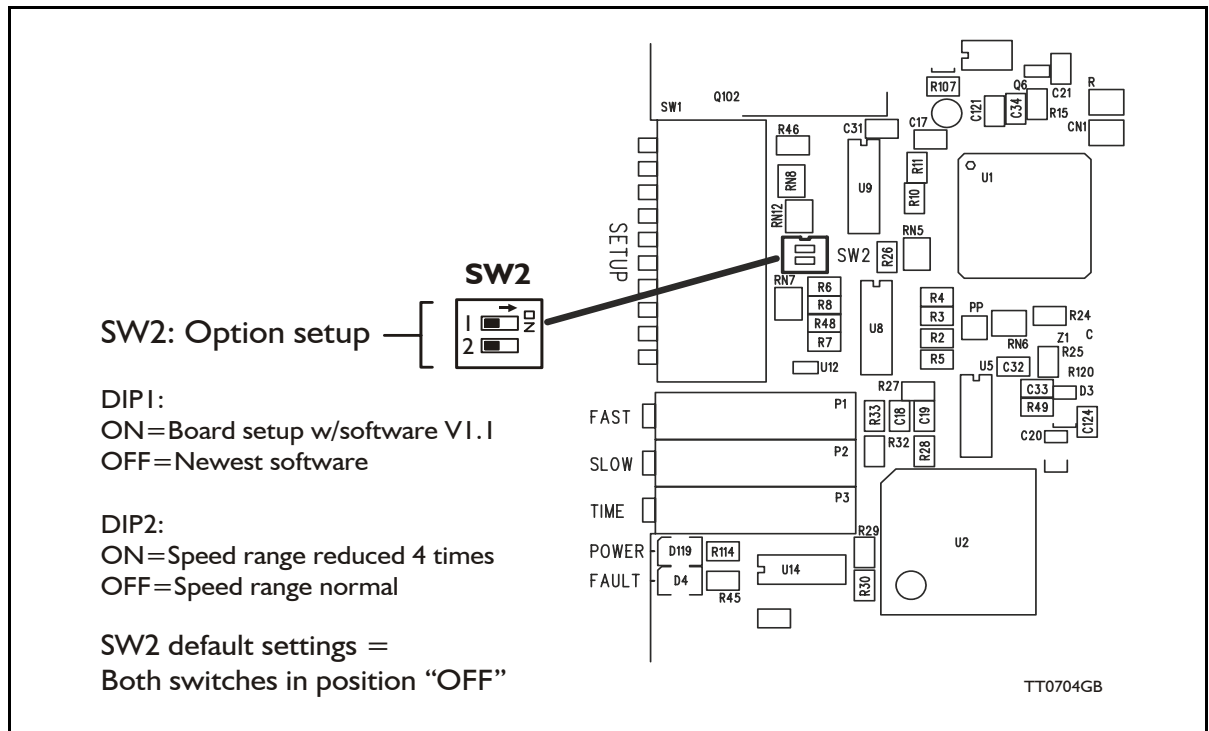
Notice that DIP2 set in position ON will decrease the specified values by 50%.

1.4.6 DIP10 - Speed Adjustment.

If the FAST or SLOW inputs are used it means that the internal step generator is used the speed for either FAST or SLOW can be adjusted at the internal potentiometers (DIP10=0) or by using the external inputs FADJ or SADJ (DIP10=1).

1.5

Option setup



1.5.1 Option setup switch (SW2)

(Only available at PA0076 version 1.4 or newer)

The first switch makes it possible to be backward compatible with boards containing software version 1.1 since certain features have been changed in newer versions in order to comply with major customer demands.

The second switch can be used to reduce the speed range for both the inputs "slow" and "fast" by 4 times. This can be useful for applications where a very low speed is desired. Please notice that this feature only take effect when using the internal step generator.

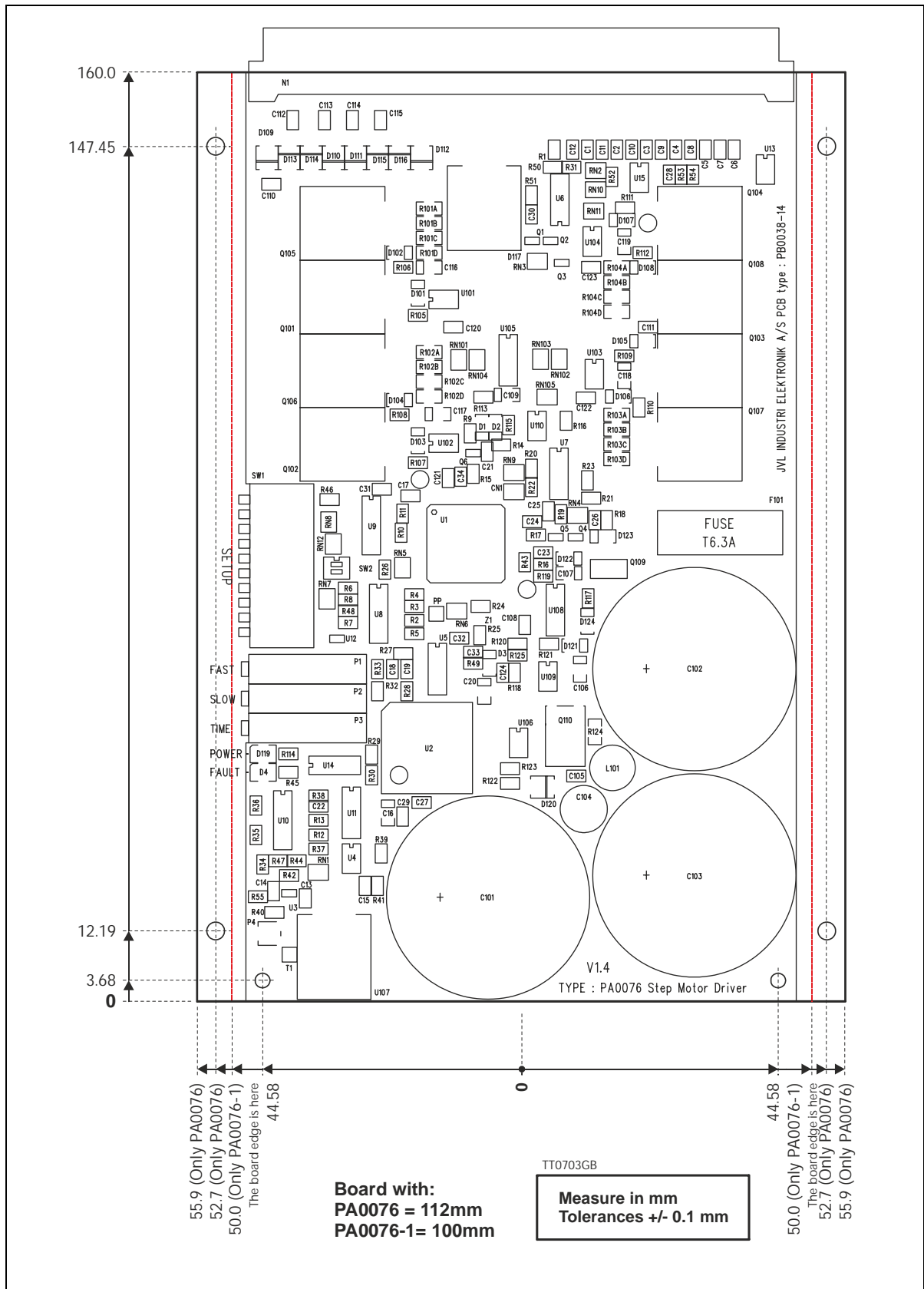
1.6

Technical Data

Description	Min.	Typical	Max.	Units
Supply - Terminals AC1, AC2, GND				
Supply Voltage (DC)	17		70	V DC
Supply Voltage (AC)	12		44	V AC
Supply frequency if using an AC source	50		60	Hz
Power Consumption (terminals except AC1/2 left open)		3		W
Motor Output A+, A-, B+, B-				
Output Voltage (dependent on supply)	0		70	V RMS
Continuous Motor Current (adjustable)	0		3.5	A RMS
Peak Motor Current	0		5	A Peak
PWM Frequency	18	20	22	kHz
All logic inputs Terminals CLK, DIR, ENRG, FAST, SLOW				
Logic 0	0		2.0	V
Logic 1	10		12	V
Only CLK input : Frequency (50% duty-cycle)	0		200	kHz
All logic outputs - Terminals ZERO, CLKO, FLT				
Logic 0 - Specified with load < 15mA	0		1.0	V
Logic 1 - Pull up resistor must be applied externally	-		30	V
Diverse :				
Operating Temperature Range	0		45	°C
Weight		460		grams
Fuse size - position F1		6.3		A T

1.7

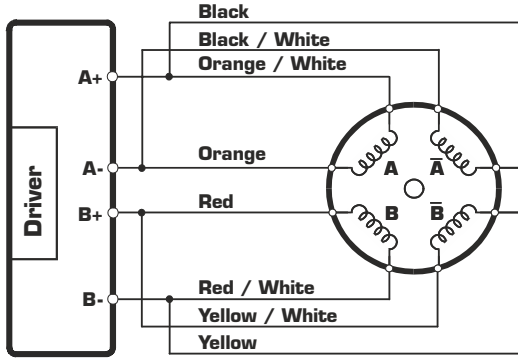
Physical Dimensions



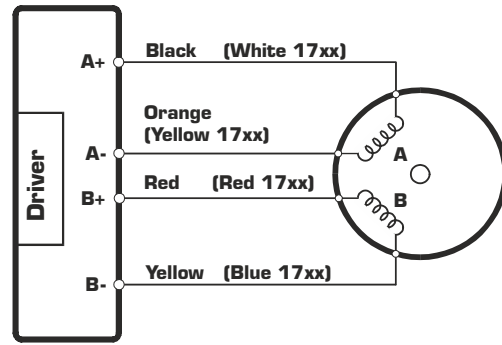
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Motor Connections

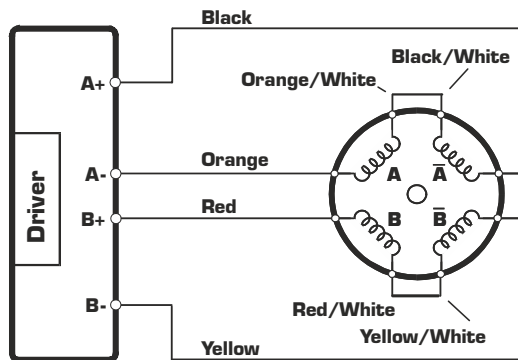
Connection of JVL and MAE motors (parallel). Type MST23x/ MST34x and HY200-xxxx-xxx-x8



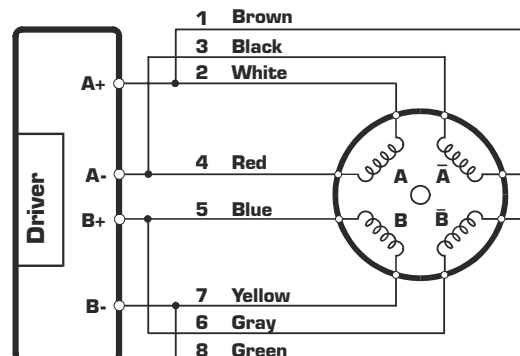
Connection of JVL and MAE 4 wire motors. Type MST17x and HY200-xxxx-xxx-x4



Connection of JVL and MAE motors (serial). Type MST23x/ MST34x and HY200-xxxx-xxx-x8

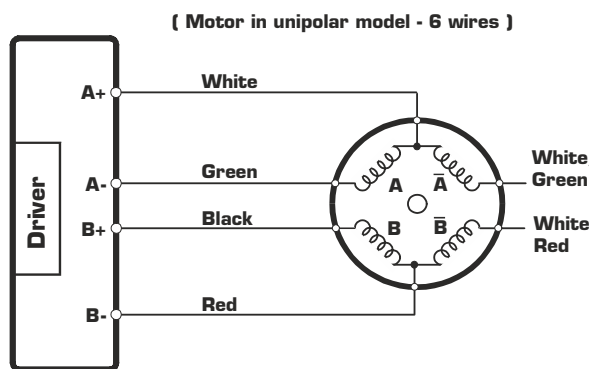


Connection of Zebotronics motor Type : SMxxx.x.xx.x (8 terminals)

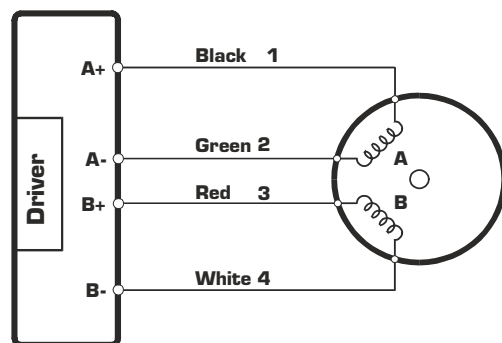


SM87/SM107/168.x.xx ↑ ↑ SM56.x.xx

Connection of MAE motor (unipol.) Type HY200-1xxx-xxxxx6



Connection of Zebotronics motor Type : SMxxx.x.xx.x (4 terminals)

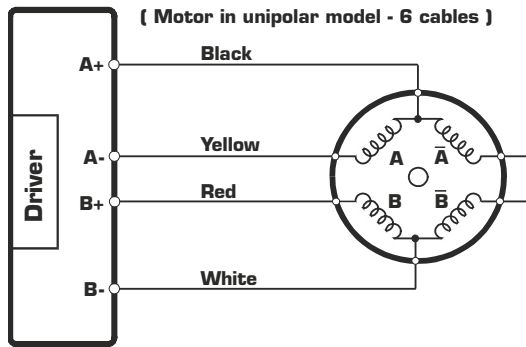


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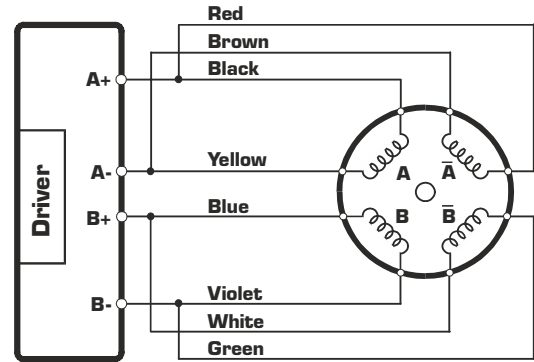
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Motor Connections

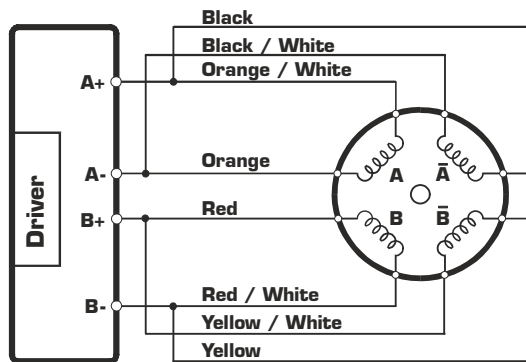
Connection of Vexta motor Type PH2xx.xxx



Connection of Phytron motor Type ZSx.xxx.x,x



Connection of Vexta stepmotor Type : PH2xx-xxx



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EU - Declaration of Conformity

Manufacturer

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Hereby declare that:**Product**

No.: PA0076
Name: Stepper Driver
Type: PA0076, PA0076A or PA0076-01

- is in conformity with:

DIRECTIVE 2004/1108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 december 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Was manufactured in conformity with the following national standards that implements a harmonised standard:

*EN 61800-3 Adjustable speed electrical power drives systems - Part 3:
EMC product standard including specific test methods*

August 2009



Bo V. Jessen
Technical Director
JVL Industri Elektronik A/S

LX0022-01GB