

# Service Bulletin SB-63

V 1.1

## Electrical Installation ID - 400

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## Overview of Service Bulletins for Integrated Drives (ID)

- SB-60** Overview of Integrated Drives
- General product description
  - Drive unit product lines and related capacitor series
  - Function levels and configurations
  - Description of module components
  - Technical specifications
  - Overview of the product range
  - Type designation
- SB-61** Drive Unit
- Drive unit product lines
  - Description of the drive unit components
- SB-62** Introduction to Stepping Motors
- Principal function of stepper motors
  - Control system of the drive unit
- SB-63** Electrical Installation ID-400
- Stepping driver control signals and connections for EXPERT ID
- SB-64** Electrical Installation ID-1200
- Stepping driver control signals and connections for EXPERT ID
- SB-65** Electrical Installation ID-2800
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- SB-66** Electrical Installation ID-5400
- Stepping driver control signals and connections for EXPERT ID
- SB-67** Step/Direction; Clockwise / Counter clockwise (CW/CCW) Interface
- Stepping driver signals
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- SB-68** Software Protocol Interface RS-232
- Specification of the interface
  - Frame structure
  - Communication protocol between the ID and the host system
- SB-69** Software Protocol Interface RS-485
- Specification
  - Frame structure
  - Communication protocol between the ID and the host system
- SB-70** Software Protocol Interface I<sup>2</sup>C
- Available soon
- SB-71** Software Protocol Interface SPI
- Available soon
- SB-72** Safety Aspects of Integrated Drives
- Capacitor
  - Electrical Insulation between ID and Capacitor
- SB-73** Test results for Integrated Drives
- Tests of components
  - Life time tests

**DATA SHEETS** are available for each Integrated Drive

# 1 Overview of Driver Unit ID – 400

Picture 1 Component parts for driver unit ID – 400.

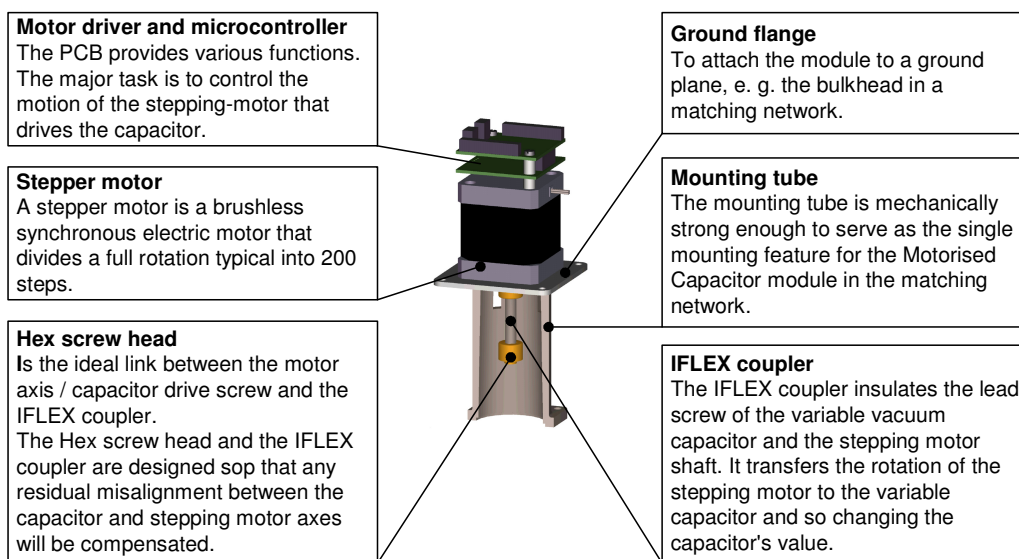


Fig. 1: Components of the driver unit ID - 400

## 2 Stepping driver controller Interface for EXPERT

### 2.1 Communication Interfaces

The interface between the controller unit (e.g. PC) and the driver board is the communication interface. Specifications of the COMET proprietary communication protocols are available for the RS-232 and RS-485 interfaces.

### 2.2 Block-diagram of the stepping motor driver

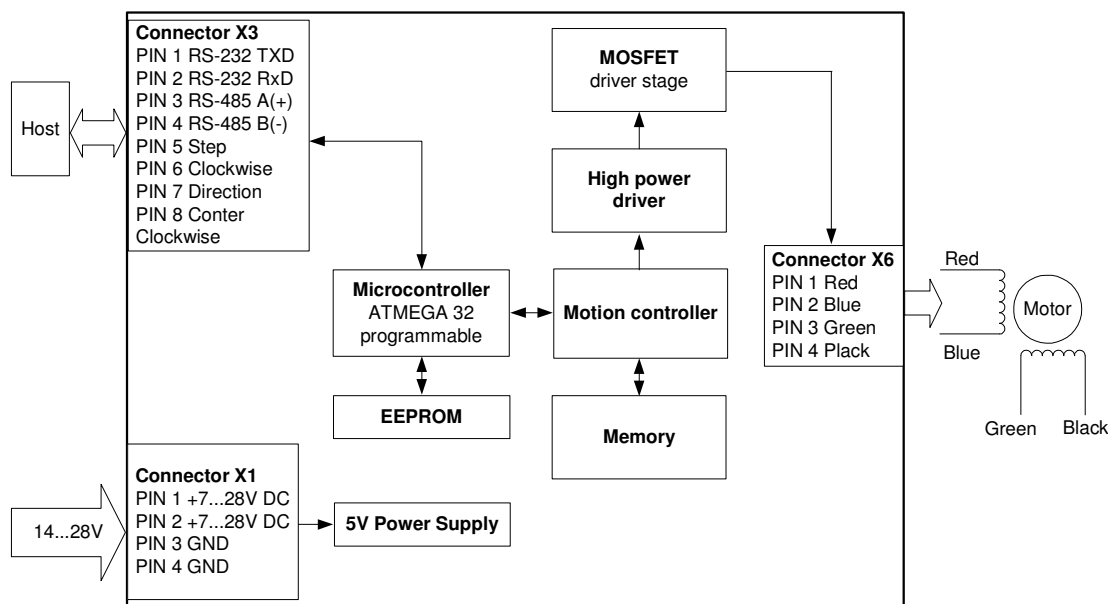


Fig. 2: Terminology of driver and motor control signals

### 3 Controller Board Connections for ID - 400

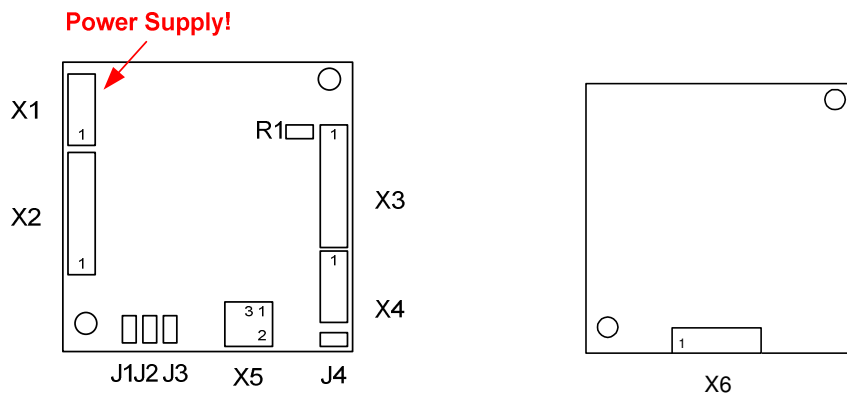


Fig. 3: Layout of the PCB

The left hand layout in Fig. 3 shows the top board, the right hand layout shows the bottom board.

#### X1 Connector - Power supply

Power is provided to the PCB through this connector. To ensure a proper flow of current, all pins of the connector must be used. The product will be shipped with a female connector that is compatible with the X1 connector on the board and with the required wires.

Pin	Function	Color
1	+ 7 ... 28 V DC	red
2	+ 7 ... 28 V DC	red
3	GND	black
4	GND	black
5	GND	black

Table 1: Pin layout of connector for X1 for the ID-400 (V.1.1)

Pin	Function	Color
1	+ 7 ... 28 V DC	red
2	+ 7 ... 28 V DC	red
3	GND	black
4	GND	black

Table 2: Pin layout of connector for X1 for the ID-400 (V.1.2)

The ID-400 incorporates a linear voltage regulator to generate the 5V supply voltage for the digital components of the module. Therefore only one supply voltage is needed for the module. The power supply voltage can be +7...+28.5 V DC. A higher voltage gives higher motor dynamics. Please note that there is no protection against reverse polarity or over voltage. The power supply should be designed so that it supplies the nominal motor voltage at the desired maximum motor power. In no case shall the supply value exceed the upper / lower voltage limit. To ensure reliable operation of the unit, the power supply has to have a sufficient output capacitor and the supply cables should be of low resistance so that the chopper operation does not lead to an increase in power supply ripple. Power supply ripple due to the chopper operation should be kept to a maximum of 200-300mV. This also is important in order to make the user's application compatible to any applicable EMC guidelines.

Therefore we recommend that:

- power supply cables be kept as short as possible
- large diameter power supply cables be used
- If the distance to the power supply is more than 2 - 6m) a robust 470 $\mu$ F or larger additional filtering capacitor be located near to the motor driver unit.

## X2 Connector - Additional I/O

- The limit switch inputs are equipped with internal pull-up resistors, so they have to be connected to GND via normally closed switches. They are used as an absolute position reference for homing and to set a hardware limit for the motion range<sup>1</sup>.
- The general purpose output is an open collector output for a maximum current of 100mA. A freewheeling diode is also included so that for example a relay or a coil can be connected directly. Please note that the freewheeling diode is connected to the supply voltage and not to +5V, so when using a relay that is connected to +5V a freewheeling diode must be connected externally.
- The general purpose input is used as a digital TTL input. When pin 7 is connected to +5V DC the ID - 400 will start with a reference drive. This feature is available from driver software version V.1.1.0.

The pin assignment of this connector is as follows:

Pin	Function
1	Left limit switch
2	Right limit switch
3	GND
4	General purpose output
5	VDD (same as connector X1, pin1)
6	GND
7	General purpose input
8	+ 5 V DC output (max. 20 mA)

Table 3: Pin layout of connector X2

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<sup>1</sup> This function is only available on request

### X3 Connector - Serial interface

This connector provides access to and from the PCB via serial interfaces, i. e. RS-232 and RS-485. Jumper J1 is used to select the proper serial interface port.

**Important:** If the Step/Direction Interface not in use, pin 5 and 7 have to be connected to GND!





Pin	Interface			
	EXPERT-1	EXPERT-2	EXPERT-3	EXPERT-3
	RS-232	RS-485	Step / Direction	CW / CCW
1	TxD	+0V (GND)	+0V (GND)	+0V (GND)
2	RxD	+0V (GND)	+0V (GND)	+0V (GND)
3	+0V (GND)	A (+)	+0V (GND)	+0V (GND)
4	+0V (GND)	B (-)	+0V (GND)	+0V (GND)
5	+0V (GND)	+0V (GND)	Step 	+0V (GND)
6	+0V (GND)	+0V (GND)	+0V (GND)	Clockwise 
7	+0V (GND)	+0V (GND)	Direction 	+0V (GND)
8	+0V (GND)	+0V (GND)	+0V (GND)	Counter Clockwise 

Table 4: Pin layout of connector X3

### X4 Connector - SPI and I2C interface

Pin	Interface	
	EXPERT-4	EXPERT-5
	I <sup>2</sup> C	SPI
1	GND	GND
2	Do not connect	Chip select (low active)
3	SDA	Serial data in (SDI)
4	SCL	Serial data out (SDO)
5	Do not connect	Serial clock (SCLK)

Table 5: Pin layout of connector X4

When using RS-232, RS-485, step direction or clockwise / counter clockwise interface this connector should not be connected.

### X5 Connector – ISP programmer

The 6-way (2x3) header on the module is the connector for an Atmel ISP programmer which can be used to program the CPU directly. This is to be done by COMET AG only. The ISP connector is for COMET use only. Always leave this connector open. The only purpose where this connector can be used by the user is to reset the module to factory defaults. To do this, first power off the module. Then connect a jumper to link pins 1 and 3. After this the power can be restored. The activity LED now flashes very quickly. Disconnect the power supply again and remove the jumper. When the module is switched on again, all settings will be restored to their factory defaults.

## X6 Connector – Motor connector

Pin	Function	Color of Lin stepping motor: 4118L-26P-02
1	OA1 (motor)	red
2	OA2 (motor)	blue
3	OB1 (motor)	green
4	OB2 (motor)	black

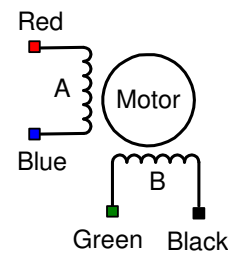


Table 6: Pin layout of connector X6 for the stepping motor

**!! The motor must never be unplugged during operation !!**

### 3.1 Jumpers J1, J2, J3 and J4

These jumpers have the following functionality:

J1: Interface selection. This jumper selects which interface is to be used when the module starts up. For RS-232 this jumper is open and for RS-485 it is closed.

J2: Step/Direction termination. Close jumper to terminate the step-signal with a 120  $\Omega$  resistor, if you **do not** want to use the step / direction interface.

J3: CAN/RS-485 termination. Close this jumper to terminate the CAN/RS-485 bus with a 120  $\Omega$  resistor.

J4: Step/Direction termination. Close jumper to terminate the direction-signal with a 120  $\Omega$  resistor, if you **do not** want to use the step / direction interface.

	RS-232	RS-485	SPI	I2C	Step / Direction	CW / CCW
Jumper - J1	Open	Close	N/A	N/A	N/A	N/A
Jumper – J2	Close	Close	Close	Close	Open	Open
Jumper – J3	Open	Open	N/A	N/A	N/A	N/A
Jumper – J4	Close	Close	Close	Close	Open	Open

Table 7: Jumper position

### 3.2 Resistor array R1

This resistor array allows the use of non differential Step/Direction signals. This voltage divider generates a half potential of the Step/Direction supply voltage to the negative differential inputs. If you use differential input signals please remove this resistor array!

### 3.3 Activity LED

The controller board of the ID-1200 is equipped with a red LED. During normal operation this LED flashes. After resetting the configuration EEPROM it may take a few seconds before the LED starts flashing again. When the operating system is being downloaded to the module the LED emits a constant light.

### 3.4 Operating ratings for the ID - 400

Sympl	Parameter	Min	Typ	Max	Unit
$V_S$	Power supply voltage for operation	7	12...28	28.5	V
$I_{COIL}$	Motor coil current for sine wave peak (chopper regulated, adjustable via software)	0	0.4...4.0	4.0	A
$I_{MC}$	Continuous motor current (RMS)	0	0.3...2.8	2.8	A
$f_{CHOP}$	Motor chopper frequency		36.8		kHz
$I_S$	Power supply current		$\ll I_{COIL}$	$1.4 * I_{COIL}$	kHz
$U_{+5V}$	+5V output (max. 20mA)	4.8	5.0	5.2	V
$V_{GPO}$	Open collector output, max. 100mA, freewheeling diode included			$V_S$	V
$V_{INPROT}$	Input voltage for StopL, StopR, GPI (internal protection, DC)	-24	0 .. 5	24	V
$V_{ANA}$	GPI analog measurement range (range switchable)		0 ... 5 0 ... 10		V
$V_{STOPLO}$	StopL, StopR low level input		0	0.9	V
$V_{STOPHI}$	StopL, StopR high level input (integrated 10k pullup to +5V)	1.9	5		V
$T_{ENV}$	Environment temperature at rated current (no forced cooling required)	-40		45	°C
$T_{ENV}$	Environment temperature at 80% of rated current or 50% duty cycle (no forced cooling required)	-40		60	°C

Table 8: Operation ratings for the ID – 400

## 4 Technical Specification

### 4.1 Technical Specification of the PCB

- Size: 42mm x 42mm
- Height: 18mm
- Two mounting holes (M3), see also Figure 4.1
- Supply voltage: 7..28V DC
- Connector type:
  - Power Supply: PHR-5
  - Additional I/O connector, RS232/RS485/CAN connector: PHR-8
- Stepper motor type: two phase bipolar
- Maximum coil current: 4.0A
- Inputs:
  - Two limit switches (digital) with internal pull-up resistors
  - One general purpose (digital (TTL) or analogue (0..+5V))
- Output:
  - One open collector output, max. 100mA, freewheeling diode included
  - One +5V output, max. 20mA

### 4.2 Connecting the Module

- Please always be sure that the boards are connected together correctly before connecting the power supply.
- Never connect or disconnect a motor when the module is powered, as this may damage the module. Also, the motor driver is not protected against short circuits to ground.
- Please do not mix up the Power connector (X1) and the IIC interface connector (X4). Connecting the power accidentally to X4 will destroy the module immediately!