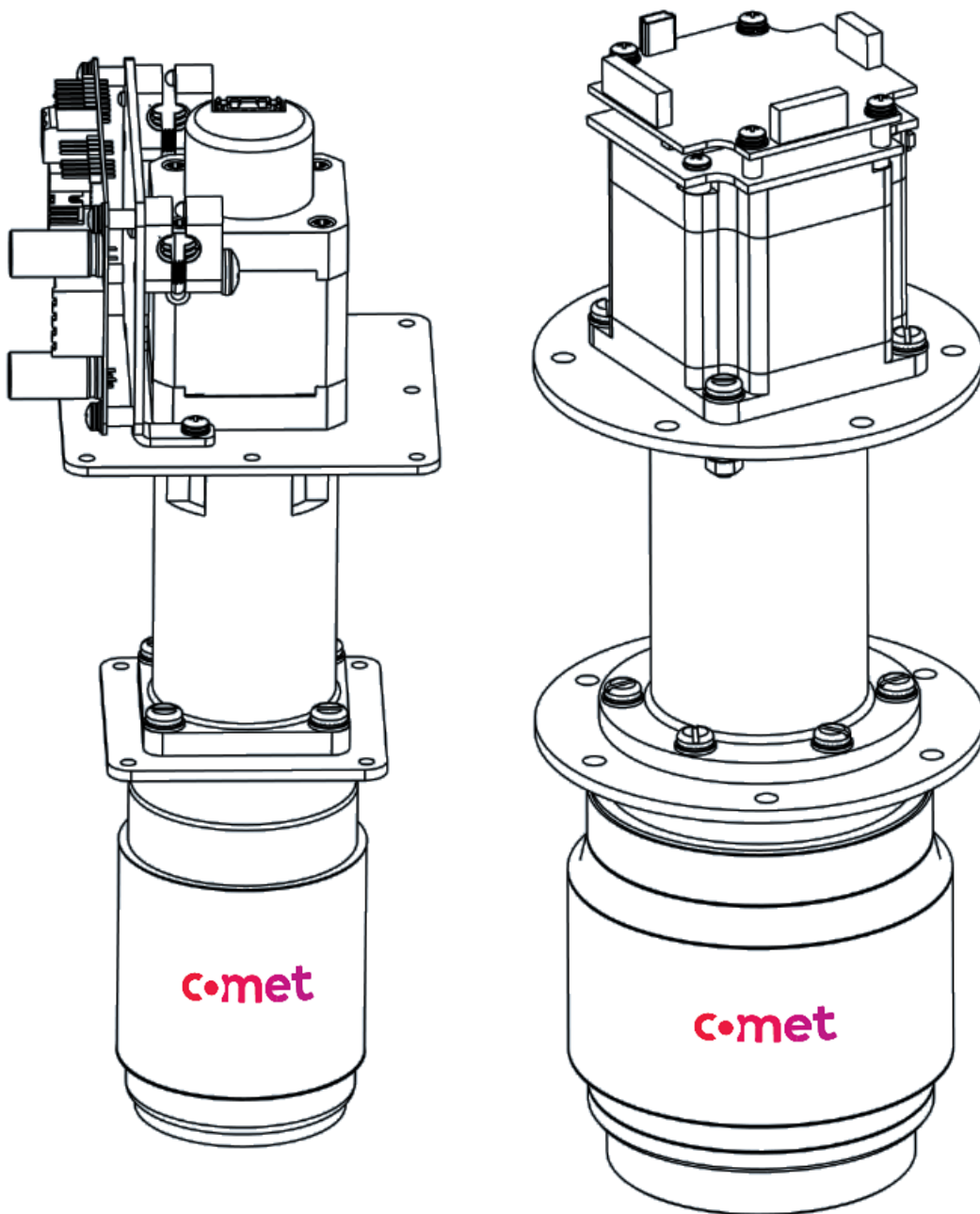


Overview Integrated Drive



Document Information

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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-63** Electrical Installation ID-400
- Stepping driver control signals and connections for EXPERT ID
 - Controller Board Connections for UNIVERSAL variant (with Encoder)
 - Controller Board Connections for UNIVERSAL variant (without Encoder)
- SB-64** Electrical Installation ID-1200
- Stepping driver control signals and connections for EXPERT ID
 - Controller Board Connections for UNIVERSAL variant (without Encoder)
- SB-68** Software Protocol Interface RS-232
- Specification of the interface
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 - Communication protocol between the ID and the host system
- SB-69** Universal-ID UA4 without Encoder, Interface Protocol RS-232 / RS-485
- Specification
 - Frame structure
 - Communication protocol between the ID and the host system
- SB-70** Universal-ID UB2 with Encoder, Interface Protocol RS-485
- Specification of RS485 Interface
 - Frame structure
 - Communication protocol between the ID and the host system
- SB-72** Safety Aspects of Integrated Drives
- Capacitor
 - Electrical Insulation between ID and Capacitor

DATA SHEETS are available for each Integrated Drive

1. General Product Description

The Integrated Drive is available for several Comet capacitor series (e.g. Maxi-Con, Hexa-Con, Power-Con, and Uni-Con) for Semiconductor and Flat-Panel applications but also for broadcast applications. All Integrated Drive modules consist of two units, a variable capacitor and a drive unit. The drive unit consists again of the following components:

- Stepping Motor
- Coupler between Variable Vacuum Capacitor and Stepping Motor
- Mounting Tube
- Capacitor Mounting Flange
- Bulkhead Mounting Flange (Ground)

Besides that, some products include additional hardware, namely Stepping Motor Driver and Microcontroller.

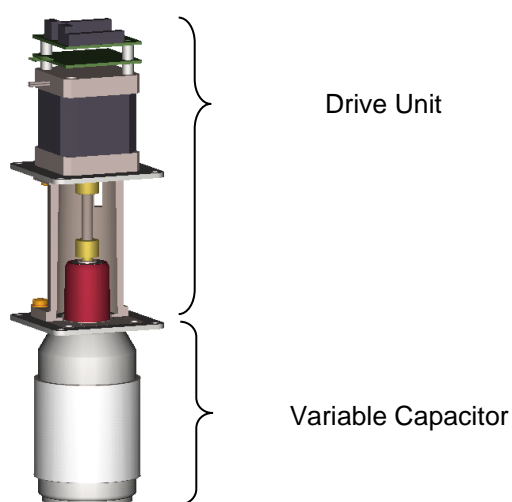


Figure 1: Picture of Integrated Drives

The Integrated Drive dramatically reduces procurement and assembly lead times and replaces tedious and error-prone manual assembly with a standardized, easy-to-install subsystem. It has the following technical benefits:

- Accurate alignment of variable capacitor, stepping-motor and coupler for high-precision operations
- A durable, backlash-free coupling connects the capacitor to the drive system
- No side load nor axial lead screw results in a longer lifetime of the lead screw
- Integrated reference index for easy calibration and recalibration
- Highly accurate repeatability of capacitance positions
- Optional downloadable C-Curve and specific module information on memory chip
- On request, an integrated stepping-motor drive as well as a microcontroller which allows high-level commands
- Easy to replace the module without further calibration

2. Integrated Drive unit product lines and related capacitor series

Integrated drive units are split in two product lines named ID – 400 and ID - 1200. The number of each product line is based on the holding torque of the stepper motor.

The typical use of the ID – 400 and ID – 1200 is for Semiconductor and Flat-Panel applications.

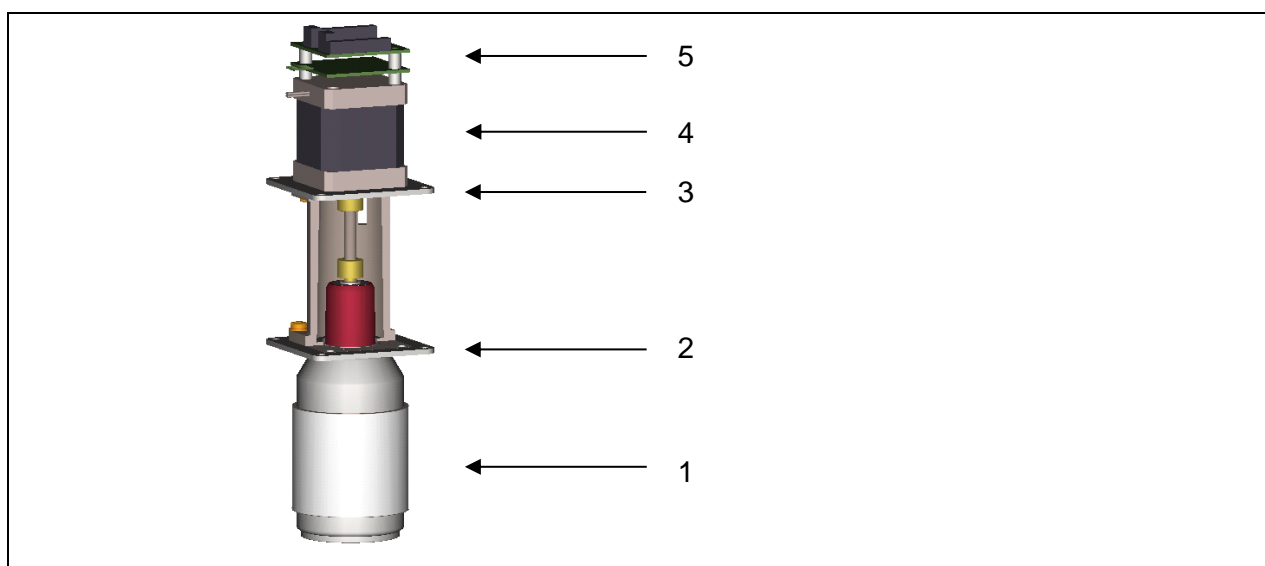
| | |
|--|--|
|  |  |
| ID - 400 | ID - 1200 |
| Typical application area: Semicon and Flat-Panel | |
| Uni-Con | Power-Con |
| Uni-Select | Hexa-Con |
| Dual-Con | Maxi-Con |
| Smart-Con | |

Table 1: Integrated Drive product lines and related capacitor series

3. Description of Module Components

The mechanical integration of the variable capacitor, the mounting tube and coupler, and the stepping motor is done in a way that perfectly aligns the capacitor's lead screw and the stepping motor shaft. In this way, the side load on the capacitor and its drive system is minimized, resulting in optimal long-life capability of these critical mechanical parts.

Mechanical end stops at both the lowest capacitance value (C_{min}) and highest capacitance value (C_{max}) are available. The end stop at C_{min} is very precise and mechanically stable and can be used for referencing the capacitor and synchronizing the capacitance values with those stored on the module. This referencing cycle will be used after a power interruption. The mechanical end stop will withstand 5000 Cycles. The stop at C_{max} , however, only prevents the lead screw from being moved out of the capacitor and eliminates the risk of damaging the motor or even the complete module. It is only a safety stop and must not be used for referencing nor should the capacitor be used beyond this point.



| Principle components of the Integrated Drive and the ID – 400, ID - 1200 | |
|--|--|
| 1. | Variable capacitor Depending on required capacitance and voltage levels Comet provides a number of different capacitors series as an Integrated Drive. |
| 2. / 3. | Mounting flange Each Integrated Drive module includes two mounting flanges: one between the stepping motor and the mounting tube and another between the mounting tube and the variable capacitor. The former intended use is to attach the module to a ground plane (4), e. g. the bulkhead in a matching network. The latter (2) is used to provide a good RF connection to the variable electrode of the capacitor. For both flanges, Comet has designed standard parts. However customized flanges will be provided at a higher price. |
| 4. | Stepping motor Stepping motors used in the Integrated Drive are two-phase types with a resolution of 200 full steps per revolution of the motor shaft. The driving mode is bipolar half coil. |
| 5. | Motor driver and controller The driver and microcontroller PCB includes stepping motor drivers and a microcontroller for various functions. Please note: the motor driver and controller are not included at the function level ENTRY. |

Table 2: Description of module components

3.1 Classification of different Insulations

This chapter describes the different available insulations.

| Type of Insulation | Description | |
|--------------------|--|----------------------------|
| Full Voltage | The motor and driver block is insulated from the variable flange of the capacitor by at least the peak working voltage U_{pw} . U_{pw} is specified for each capacitor in its corresponding datasheet. The insulation distance is determined according to EN50178. | |
| | ID 400 ($U_{pw,max} = 9 \text{ kV}$) | Insulation distance: 23 mm |
| | ID1200 ($U_{pw,max} = 15 \text{ kV}$) | Insulation distance: 40 mm |
| GND insulation | The motor and driver block has a electrical connection with the variable flange of the capacitor | |

Table 3: Classification of Insulations

4. Technical specifications

| | ID - 400 | ID - 1200 |
|------------------------|----------|-----------|
| Power supply | 24 V | 24 V |
| Holding torque | 0.4 Nm | 1.2 Nm |
| Motor dimension | □ 42 mm | □ 56 mm |

Table 4: Technical specifications

For further technical specifications refer to SB-63 (ID-400) / SB-64 (ID-1200)

5. Overview of the product range

| ID | Function-level | Configurations- level | Electrical interface |
|--|----------------|-----------------------|--|
| ID-400 Uni-Con Uni-Select Dual-Con Smart-Con | ENTRY | ENTRY-1 | Stepping Motor |
| | EXPERT | EXPERT-1 | RS-232 |
| | | EXPERT-2 | RS-485 |
| | | EXPERT-3 | STEP/DIR; Clockwise / Counterclockwise |
| | UNIVERSAL | UA4 | RS232 / RS485 |
| | | UB2 Encoder | RS485 |
| ID-1200 Maxi-Con Hexa-Con Power-Con | ENTRY | ENTRY-1 | Stepping Motor |
| | EXPERT | EXPERT-1 | RS-232 |
| | | EXPERT-2 | RS-485 |
| | | EXPERT-3 | STEP/DIR; Clockwise / Counterclockwise |
| | UNIVERSAL | UA4 | RS232 / RS485 |
| | | UB2 Encoder | RS485 |

Table 5: Overview of the product range

6. Type designation

C M U N – 500 A C/8 – U A 4 – F 1

| | |
|-------------------|---|
| <u>CM</u> | Motorized Capacitor |
| <u>U N</u> | Capacitor Series Name |
| | UN = Uni-Con |
| | HE = Hexa-Con |
| | PO = Power-Con |
| | SA = SAMi-Con |
| | MA = MAMi-Con |
| | LA = LAMi-Con |
| <u>500</u> | Maximum nominal Capacitance Cmax [pF] |
| <u>A</u> | Capacitor Block |
| <u>C</u> | Cooling System |
| <u>8</u> | Maximum voltage – Peak Test U_{pt} [kV] |
| <u>X</u> | Function Level |
| | E = Entry |
| | X = Expert |
| | U = Universal |
| <u>S</u> | Shielded Version (no letter when not shielded) |
| | S = Shielded Version |
| | A = PCB-2017 |
| | B = PCB-2020 with encoder |
| <u>1</u> | Configuration / Interface Letter |
| | 1 = RS-232 |
| | 2 = RS-485 |
| | 3 = Step/Direction; Clockwise / Counterclockwise |
| | 4 = RS232/RS485 |
| | 5 = I ² C |
| | *No number for Entry Integrated Drive |
| <u>F</u> | Isolation* Letter |
| | F = Full Voltage Version |
| | R = Reduced Voltage Version |
| | G = Ground Version |
| | *Isolation between the motor flange and the capacitor variable end flange |
| <u>1</u> | Product configuration |
| | No number = COMET standard version of motorized capacitor |
| | Single digit = Customer specific version (correlated to the ERP variant / no left-hand zeros) |
| | Seven digits = ID still in project status |

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