DUPLOMATIC
MOTION SOLUTIONS

SCH
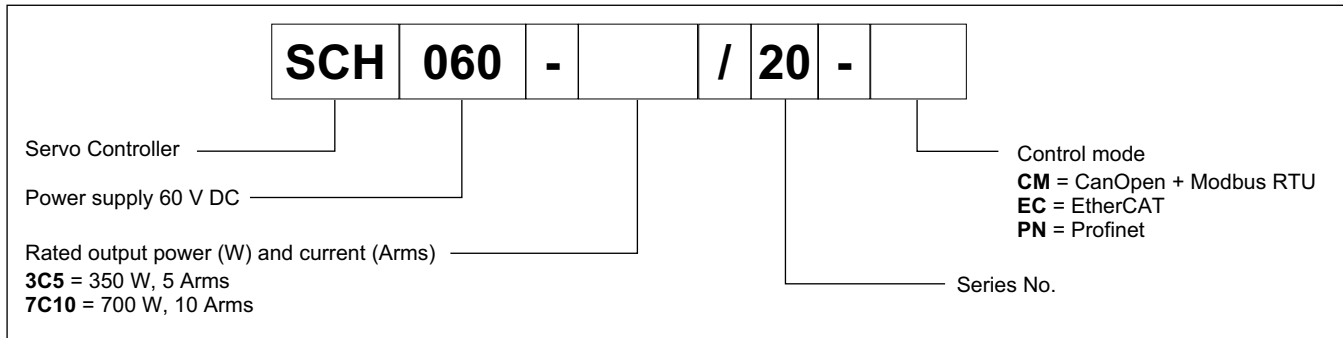## SERVO CONTROLLERS FOR BRUSHLESS MOTORS
SERIES 20

DESCRIPTION

— SCH series is a general purpose controller family that can be used to control MBH motors.

— SCH controllers are compact, powerful and simply to use, they support up to 4 fieldbus: Modbus, CanOpen, ProfiNet, EtherCAT. Many I/O useful functions (torque control, cogging compensation, jerk, multipositioning, etc.) are available.

— Different supply voltage are available: direct current or alternate current (1-phase or 3-phase).

— Motor setting and fine tuning can be made via PC. Different motor feedbacks are supported (incremental and absolute encoder).

— The Safety Torque Off (STO) function is available.

TECHNICAL CHARACTERISTICS

		SCH060-3C5	SCH060-7C10	SCH230-6C2	SCH230-13C4	SCH230-20C6
Main supply voltage		60 V DC		1-phase or 3-phase 230 V AC	1-phase or 3-phase 230 V AC	3-phase 230 V AC
Logic supply voltage		+24 V DC ±20%				
Output current: rated peak (2 sec)	A rms A	5 10	10 20	2 4	4 8	6 12
Feedback input (encoder)		Hall sensors, 5V incremental, absolute				
Brake chopper circuit		-	-	integrated		
Control mode		Position, speed or torque				
Interfaces		Modbus, CanOpen, EtherCAT or ProfiNet				
Cooling method		natural cooling	natural cooling	natural cooling	fan	fan
Rated working altitude	m	Up to 1000 m. For upper altitude, degrade controller by 1% each additional 100 m				
Electromagnetic compatibility (EMC)		according to 2014/30/EU standards				
Operating temperature range	°C	-20 / +40				
Storage and transport temperature	°C	-20 / +70				
Humidity	RH	< 80%, without condensation				
Protection degree		IP20				
Mass	kg	0.4	0.4	1.1	1.2	1.2

1 - SERVOCONTROLLERS FOR BRUSHLESS MOTOR DC

1.1 - Identification code

| SCH | 060 | - | | /20 | - | |

Servo Controller

Power supply 60 V DC

Rated output power (W) and current (Arms)
3C5 = 350 W, 5 Arms
7C10 = 700 W, 10 Arms

Series No.

Control mode
CM = CanOpen + Modbus RTU
EC = EtherCAT
PN = Profinet

1.2 - Technical characteristics

		SCH060-3C5	SCH060-7C10
Min / max supply voltage	DC	20 ÷ 80 V	
Rated current	Arms	5	10
Peak current (2 sec)	Arms	10	20
Nominal output power	W	350	700
Backup logic supply	V DC	+24 V DC ±20%	
External EMC filter		not required	
Digital I/O		6 PNP input; 2 NPN/PNP output	

2 - SERVOCONTROLLERS FOR BRUSHLESS MOTOR AC

2.1 - Identification code

| SCH | 230 | - | | /20 | - | |

Servo Controller

Power supply 230V AC

Rated output power (W) and current (Arms)
6C2 = 650 W, 2 Arms
13C4 = 1300 W, 4 Arms
20C6 = 2000 W, 6 Arms

Series No.

Control mode
CM = CanOpen + Modbus RTU
EC = EtherCAT
PN = Profinet
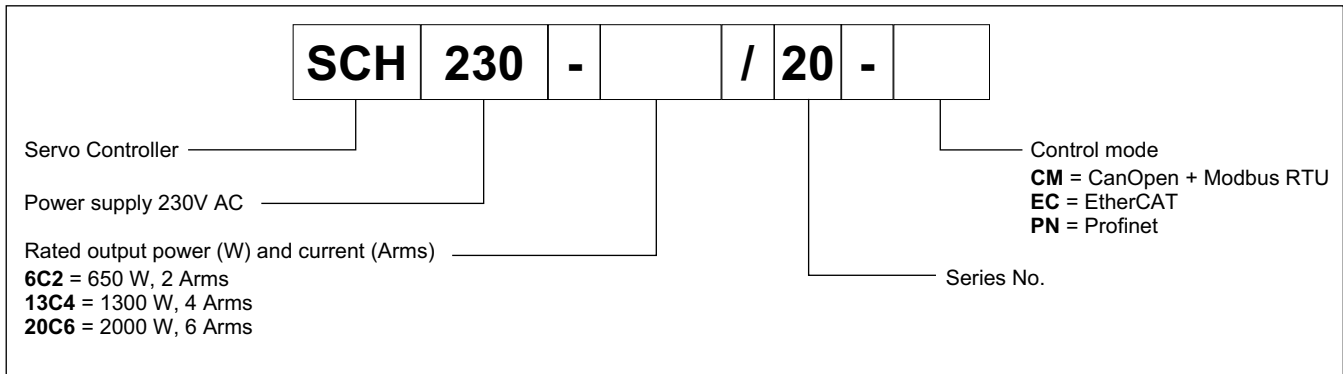
2.2 - Technical characteristics

		SCH230-6C2	SCH230-13C4	SCH230-20C6
Min / max supply voltage	AC DC	1-phase or 3-phase 230 ±15% 50/60Hz 200 ÷ 360 V DC		3-phase 230 ±15% 50/60Hz 200 ÷ 360 V DC
Rated current	Arms	2	4	6
Peak current (2 sec)	Arms	4	8	12
Nominal output power	W	650	1300	2000
Logic supply	V DC	+24 V DC ±20% max 500 mA		
Suggested external braking resistor		47 Ohm / 50 W	39 Ohm / 90 W	
Security function		STO - Safe Torque Off: IEC61800-5-2:2007 - SIL3 Cat.0: EN61508:2001 (EN954-1:1996)		
External EMC filter		in appliance of optional IEC 61800-3 cat C2 and C3		
Digital I/O		6 NPN/PNP input; 3 NPN/PNP output		

3 - COMMON FEATURES

Control method
- IGBT/PWM, sinusoidal or trapezoidal for brushless motors, control for brushed DC motors and Asynchronous AC motors (V/f)
- Speed - Adjustable ramps - Torque control - Multipositioner - Electronic gearbox - Electronic CAM - Pressure Control

Analogue main input
±10V Differential (12Bit), SPEED and TORQUE

Analogue auxiliary input
0/+10V Single ended (12Bit), SPEED and TORQUE

Frequency input
Pulse/Direction - 5V Line controller channels A/B - CW/CCW (2MHz), SPEED and POSITION

Fieldbus
Modbus RTU/CanOpen CiA 402
EtherCat CoE
ProfiNet RT and IRT

Main Feedback
Halls Sensors - Incremental Encoder 5V Line controller with/without Halls sensors - Absolute Encoder SSI Binary - Sensorless

Auxiliary feedback
5V Line controller encoder - channels A/B

Encoder output (available only with incremental encoder feedback)
Repetition of ABZ channels repetition of the main feedback, or frequency reference repetition

Limit Switch management function
Braking in torque limit in case of P-OT, N-OT

Digital Filters
Notch filter, Iq filter, digital input filter, position observer

Protections functions
Short-circuit, over/undervoltage, controller overtemperature, feedback break, rated current limit

Software Safety functions
Fault reaction and emergency stop modes: inertia stop, ramp stop , torque limit stop

Braking in torque limit in case of a limit switch.

Controller signaling
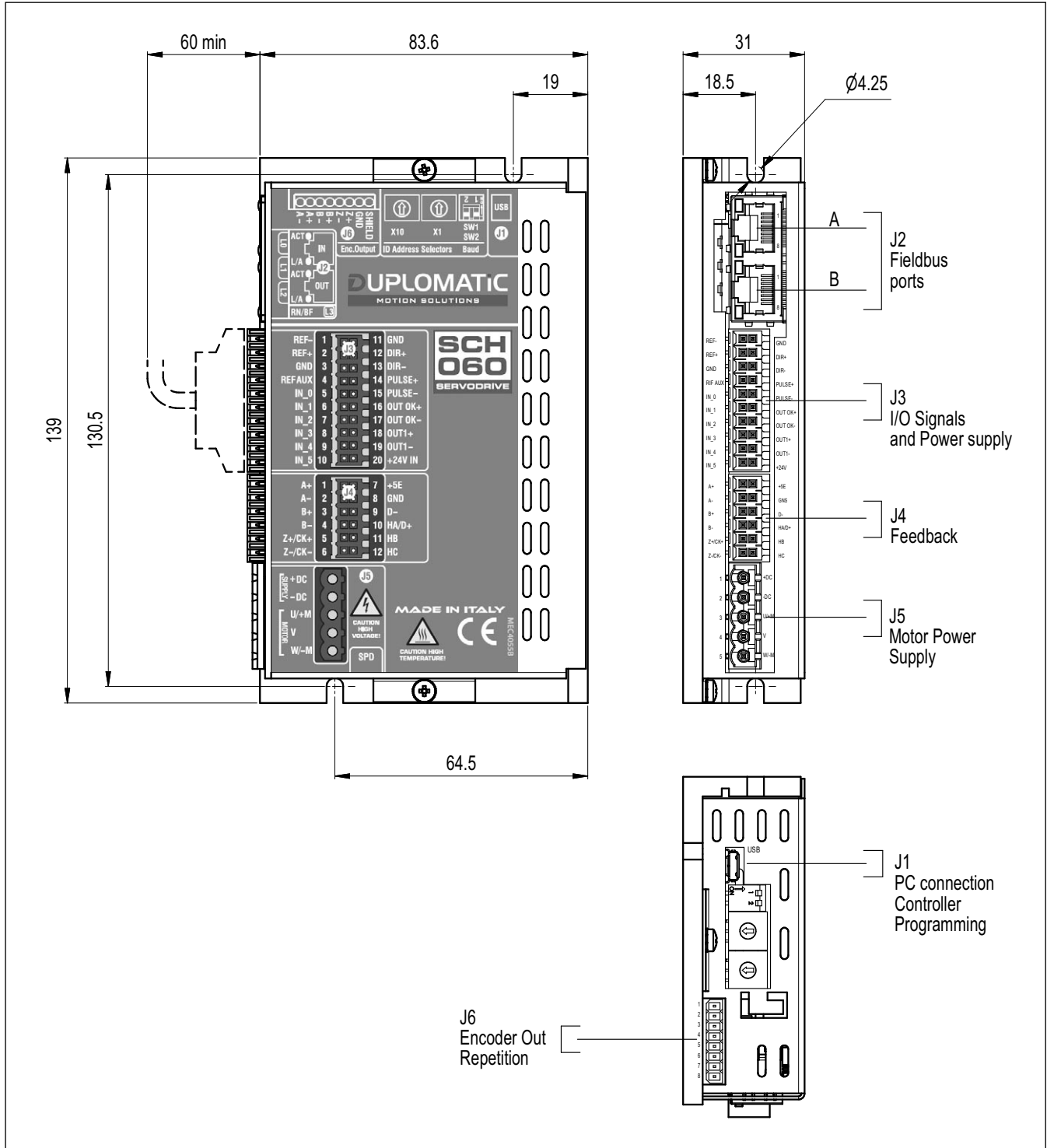3 LEDs for status and alarms
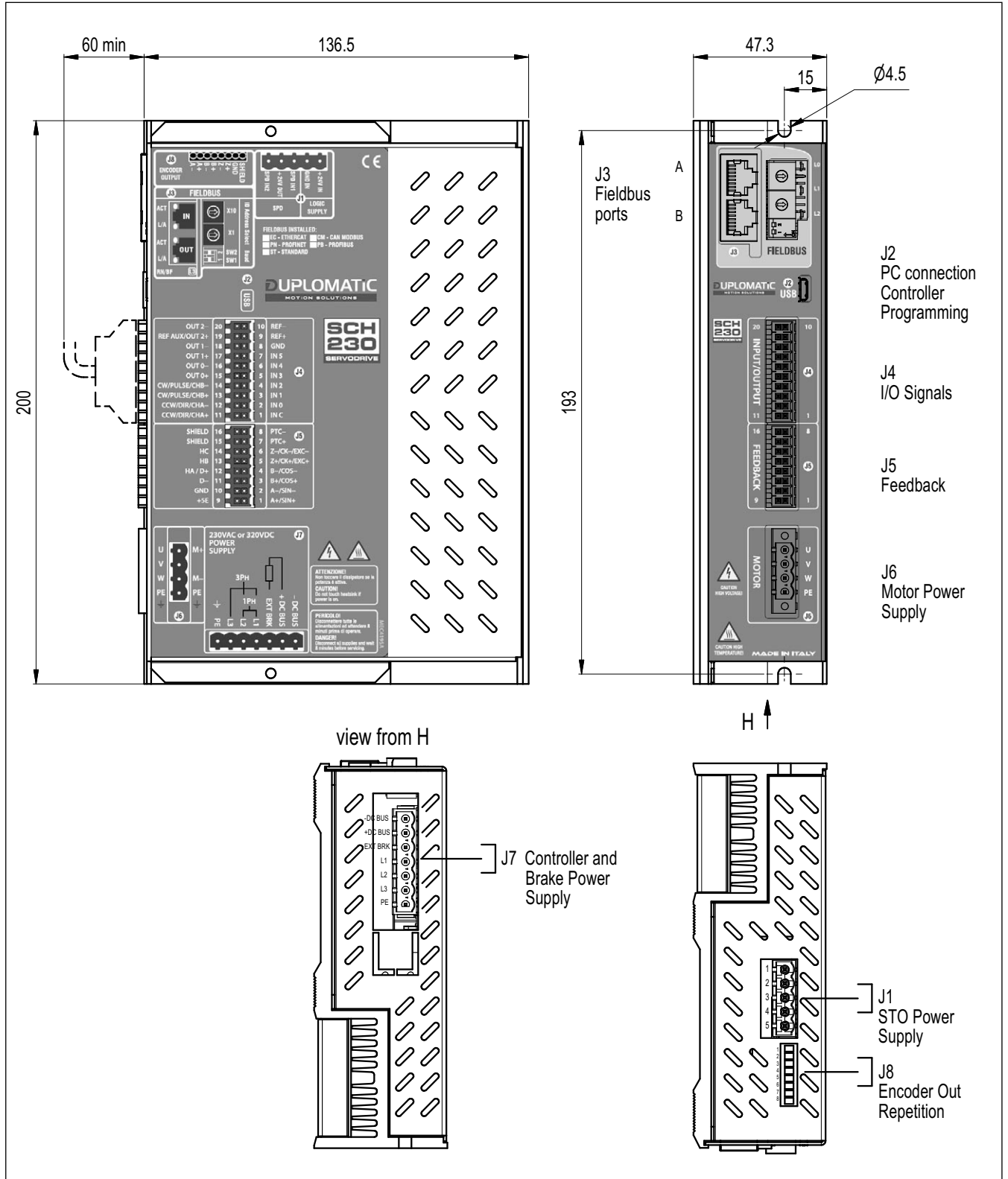
Brake management
Integrated. Immediate stop or in ramp

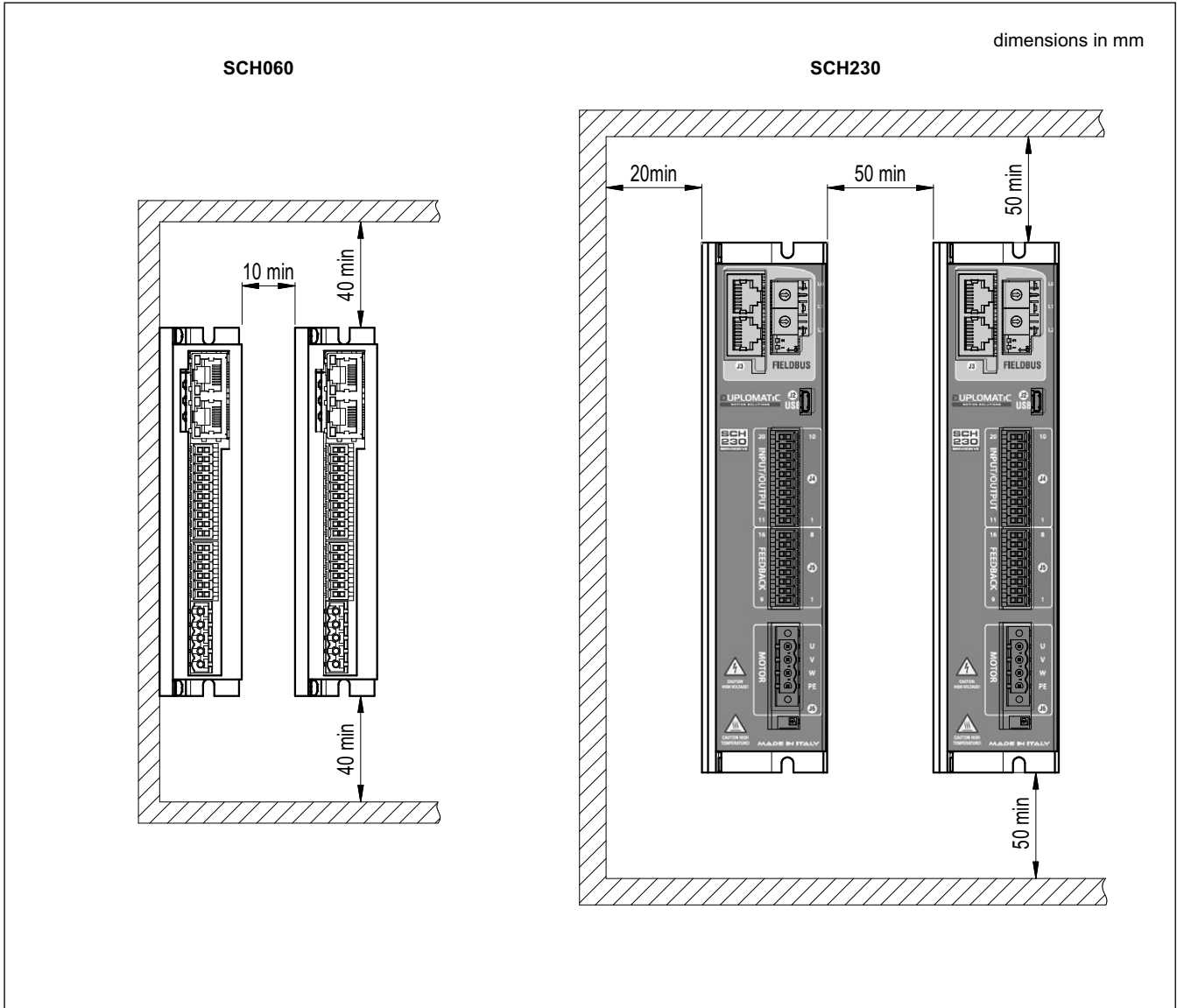**Additional features**
Brushless motor cogging compensation

3 - SCH060 WIRING AND OVERALL DIMENSIONS

Dimensions: 60 min, 83.6, 19, 31, 18.5, Ø4.25, 139, 130.5, 64.5

J2 Fieldbus ports (A, B)

J3 I/O Signals and Power supply

J4 Feedback

J5 Motor Power Supply

J1 PC connection Controller Programming

J6 Encoder Out Repetition

SCH 060 SERVODRIVE

DUPLOMATIC MOTION SOLUTIONS

MADE IN ITALY

CAUTION HIGH VOLTAGE!

CAUTION HIGH TEMPERATURE!

J3
REF–	1	11	GND
REF+	2	12	DIR+
GND	3	13	DIR–
REFAUX	4	14	PULSE+
IN_0	5	15	PULSE–
IN_1	6	16	OUT OK+
IN_2	7	17	OUT OK–
IN_3	8	18	OUT1+
IN_4	9	19	OUT1–
IN_5	10	20	+24V IN

J4
A+	1	7	+5E
A–	2	8	GND
B+	3	9	D–
B–	4	10	HA/D+
Z+/CK+	5	11	HB
Z–/CK–	6	12	HC

J5
+DC / –DC SUPPLY
U/+M / V / W/–M MOTOR

4 - SCH230 WIRING AND OVERALL DIMENSIONS

60 min   136.5   47.3   15   Ø4.5

200   193

J3 Fieldbus ports

A
B

J2 PC connection Controller Programming

J4 I/O Signals

J5 Feedback

J6 Motor Power Supply

view from H

H

J7 Controller and Brake Power Supply

J1 STO Power Supply

J8 Encoder Out Repetition

3 - SERVO CONTROLLER INSTALLATION

dimensions in mm

SCH060

SCH230

4 - PIN TABLES FOR SCH060

4.1 - J1 Controller setting

Connector type: Micro USB AB type

This port is a USB 2.0 communication port at 12 Mbps, for set, tuning and diagnostic procedures via software and for firmware upgrade. It's allowed to use USB 2.0 HUBs in cascaded connection to visualize more axes with the same PC.

⚠ Before connecting a desktop PC to the controller, ensure that PC Power Earth is the same of the controller, otherwise, use an insulated laptop PC.

4.2 - J2 Fieldbus connection

Connector type: double RJ45: IN (A) and OUT (B) port

The ports configuration differs according to the chosen fieldbus type (control mode CM, EC or PN). Please refer to the Start-up manual of SCH060 controller.

4.3 - J3 I/O signals and power supply

Connector type: double row, pitch 3.5 mm

Use at least 0.5 mm² section cables (AWG20) for pin 11and pin 20. A shielded cable is required for pins from 12 to 15.

Pin	Tag	Description
1	REF-	±10 V
2	REF+	12 bit ADC differential analog input for main reference. Available also as digital input IN_6 (single ended PNP).
3	GND	0 ÷ 10 V
4	RIF AUX	12 bit ADC single-ended analog input for auxiliary reference. Available also as PNP digital input IN_7.
5	IN_0	
6	IN_1	
7	IN_2	Programmable digital input function defined by chosen operating mode
8	IN_3	
9	IN_4	
10	IN_5	
11	GND	0V - Ground reference for +24 V DC supply and for digital input signals IN_0 to IN_5.
12	DIR+	
13	DIR-	Frequency main reference input
14	PULSE+	
15	PULSE-	
16	OUT OK+	Optoinsulated programmable NPN/PNP digital output. Normally used for "Drive OK" function. HIGH: active, no alarms occured.
17	OUT OK-	LOW: disabled; an error occures and the controller shuts down in fault condition.
18	OUT1+	Optoinsulated programmable NPN/PNP digital output.
19	OUT1-	
20	+ 24V	+24 V DC - Backup logic supply when main supply is disconnected.

4.4 - J4 Motor feedback

Connector type: double row, pitch 3.5 mm

Use shielded cable and connect shield to PE. Keep I/O cables far from supply and feedback cables.

Pin	Tag	Description
1	A+	Differential line driver (5V) input for incremental channel A.
2	A-	
	A	Single (5V) Open Collector and Push Pull input for incremental channel A.
3	B+	Differential line driver (5V) input for incremental channel B.
4	B-	
	B	Single (5V) Open Collector and Push Pull input for incremental channel B.
5	Z+ / CK+	Differential line driver (5V) input for channel Z of incremental encoder.
6	Z- / CK -	Differential line driver (5V) output for CLOCK data for SSI absolute encoder
	Z	Single (5V) Open Collector and Push Pull input for incremental channel Z.
7	+5E	+5V encoder supply and for pull up resistors.
8	GND	Common Ground for encoder supply and signals.
9	D -	Differential line driver (5V) input for DATA for SSI absolute encoder.
10	(HA) / D +	
	HA / D +	HALL sensor A signal
11	HB	HALL sensor B signal
12	HC	HALL sensor C signal

4.5 - J5 Motor connection and power supply

Connector type: Power connector, pitch 5 mm

Before providing power supply voltage, ensure that J5 connector is properly inserted.

Connect correctly U,V,W wiring both the controller and the motor: the inversion of the phases do not invert the rotation direction of the motor.

Pin	Tag	Description
1	+DC	DC power supply connection. Ensure that -DC pin, power cable shields and encoder cable shield are connected to PE
2	- DC	
3	U	U motor connection
4	V	V motor connection
5	W	W motor connection

4.6 - J6 Incremental encoder repetition

connector type: Push-in, pitch 2.5 mm

This is a 5V hardware buffered line - controller output for incremental channel and zero index derived from main feedback incremental encoder.

Pin	Tag	Description
1	SHIELD	Cable shield connection
2	GND	Common ground
3	Z+	Differential line controller (5V) output for incremental channel Z
4	Z-	
5	B+	Differential line controller (5V) output for incremental channel B
6	B-	
7	A+	Differential line controller (5V) output for incremental channel A
8	A-	

5 - PIN TABLES FOR SCH230

5.1 - J1 Logic supply and SPD function

connector type: single row, pitch 5 mm

Pin	Tag	Description
1	+24 V IN	DC power supply connection for logic
2	GND IN	
3	SPD IN 1	Input of redundant channel 1 for SPD safety function
4	+24V SPD	Power supply output for the SPD safety circuit.
5	SPD IN 2	Input of redundant channel 2 for SPD safety function

This port provide connections for logic supply and for the security function SPD (secure power disable). This function is also called STO.

5.2 - J2 Controller setting

Connector type: Micro USB AB type

Please refer to point 5.1

5.3 - J3 Fieldbus connection

Connector type: double RJ45: IN (A) and OUT (B) port.

The ports configuration differs according to the chosen fieldbus type (control mode CM, EC or PN). Please refer to the Start-up manual of SCH230 controller.

5.4 - J4 I/O signals

connector type: double row, pitch 3.5 mm

A shielded cable is required for pins from 11 to 14.

Pin	Tag	Description
1	IN_C	Common reference for NPN or PNP digital inputs.
2	IN_0	NPN/PNP digital input with function defined by chosen operating mode
3	IN_1	
4	IN_2	
5	IN_3	
6	IN_4	
7	IN_5	
8	GND	0V - Ground reference for analogue input
9	REF+	±10 V 12 bit ADC differential analog input for main reference Available also as digital input IN_6 (single ended PNP)
10	REF-	
11	CCW/DIR/CH +	Frequency main reference input
12	CCW/DIR/CH -	
13	CW/PULSE/CH +	
14	CW/PULSE/CH -	
15	OUT 0 +	Optoinsulated programmable NPN/PNP digital output. Normally used for "Drive OK" function HIGH: active, no alarms occured LOW: disabled; an error occures and the controller shuts down in fault condition
16	OUT 0 -	
17	OUT1 +	Optoinsulated programmable NPN/PNP digital output
18	OUT1 -	
19	(OUT2+) / REF AUX	0 ÷ 10 V 12 bit ADC single-ended analog input for auxiliary reference (GND at pin 8) Available also as PNP digital input IN_7
	OUT2 + / (REF AUX)	Optoinsulated programmable NPN/PNP digital output
20	OUT2 -	

5.5 - J5 Motor feedback

Connector type: double row, pitch 3.5 mm

Use not twisted shielded cable for incremental and absolute encoder feedback. Use twisted shielded cable for resolver feedback. Keep I/O cables far from supply and feedback cables.

Pin	Tag	Description
1	A + / SIN+	Differential line controller (5V) input for incremental channel A.
2	A - / SIN -	Differential input for Resolver channel SIN.
	A	Single (5V) Open Collector and Push Pull input for incremental channel A.
3	B + / COS+	Differential line driver (5V) input for incremental channel B.
4	B - / COS -	Differential input for Resolver channel COS.
	B	Single (5V) Open Collector and Push Pull input for incremental channel B.
5	Z + / CK+ / EXC+	Differential line controller (5V) input for channel Z of incremental encoder.
6	Z - / CK - / EXC	Differential line controller (5V) output for CLOCK data for SSI absolute encoder. Differential output for reference to Resolver feedback.
	Z	Single (5V) Open Collector and Push Pull input for incremental channel Z.
7	PTC+	Digital input for motor PTC. If motor is devoid of PTC, ensure to short pin 7 and 8.
8	PTC-	
9	+5E	+5V encoder supply.
10	GND	Common Ground for encoder supply and signals.
11	D -	Differential line controller (5V) input for DATA for SSI absolute encoder.
12	(HA) / D +	
	HA / D +	HALL sensor A signal
13	HB	HALL sensor B signal
14	HC	HALL sensor C signal
15	SHIELD	Feedback and signal cable shield. This pin is connected to controller Power Earth (PE)
16	SHIELD	

5.6 - J6 Motor power supply

Connector type: power connector, pitch 5 mm

Before providing power supply voltage, ensure that J5 connector is properly inserted. Connect correctly U,V,W wiring both the controller and the motor: the inversion of the phases do not invert the rotation direction of the motor.

Pin	Tag	Description
1	U	U motor connection
2	V	V motor connection
3	W	W motor connection
4	PE	Power Earth connection , PE

5.7 - J7 Controller logic supply and braking

Connector type: single row, pitch 5 mm

If DC power supply or DC linked configuration is used, it's recommended to use shielded cable; please connect shields to earth both side of connection.

Pin	Tag	Description
1	- DC BUS	Connection for DC power supply
2	+ DC BUS	
3	EXT BRK	External braking resistor connection
4	L1	Connection for AC power supply:
5	L2	• L1 - L2 for single phase controller version
6	L3	• L1 - L2 - L3 for triphase controller version
7	PE	Controller power supply, Power Earth

5.8 - J8 Incremental encoder repetition

Connector type: Push-in, pitch 2.5 mm

This is a 5V hardware buffered Line-Driver output for incremental channel and zero index derived from main feedback incremental encoder. Please refer to point 5.7: pin table is the same.

6 - CABLES CONNECTION

The connection cables to the MBH motors (catalog 2160) are available. The cables are pre-wired on the motor side and with free conductors to wire on the controller side.

The standard length is 5 meters. For other lengths, please contact our sales department.

Order them using the identification codes here below.

Power cable	**CBHP-ML05**
M25 encoder cable	**CBHE-ML05**
M16 encoder cable	**CBHA-ML05**
Brake cable	**CBHB-L05**