

OPERATION AND SAFETY INSTRUCTION MANUAL

ENCU



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Thank you for purchasing a Walmag Magnetics Control unit for electro-magnetic devices. The standard delivery consists of:

- One electronic control unit with or without remote control.
- One instruction manual
- One set of wiring diagrams.

This manual is an integral part of the product and must be retained for further use for its entire lifetime. Please read it carefully and understand it before installing and using you magnetic clamping system.

1 DECLARATION OF CONFORMITY

EM-CU controllers comply with the standards related to the Low Voltage Directive:

- EN 60204-1
- Machinery safety Electric Equipment, Part 1: general claims. EMC, generic standards

2 SAFETY AND SAFETY SYMBOLS

EN 61000-6-4 ED.2



DANGER - Operations which might entail risks if not performed correctly

All persons involved in the operation, maintenance, and service of control units for magnetic clamping and holding devices must be appropriately qualified and strictly follow these operating instructions. These operating instructions comprise all information necessary for the safe and optimal use of the control unit. This not only concerns the functional reliability of the device, but also your personal safety.



DANGER - the risk of magnetic fields

The permissible levels of exposure to DC magnetic fields are not exceeded. In case of persons with ferromagnetic and/or active implants, it is necessary to decide individually about their employment. Persons with cardiac pacemakers are not allowed to be within the range of the magnetic field.



Authorized person

A person selected or assigned by the employer as being competent to replace specific parts listed in this manual and is able to verify the proper functioning of the entire product after completion of the installation.

3 CONTROL UNITS

3.1 Warranty

The warranty period is 12 months from the first commissioning, under the following conditions:

- The control unit must be operated within the limits of use and in accordance with instructions given in this manual.
- The periodic maintenance of the device must be carried out, using the prescribed spare parts.
- The device is to be operated by qualified and trained personnel only.

Warranty is void in case of:

- Mains voltage and frequency being out of the range specified in this manual.
- Wrong usage or installation relative to instructions presented in this manual.
- Usage of different electrical protection than is specified in this manual.
- Unauthorized modifications brought to our material.

3.2 Operating principle

EM-CU Control units are designed to magnetize and demagnetize Electro-magnetic devices such as electro-magnetic chucks and lifters.

Magnetization consists of supplying a continuous DC output voltage to the device. Standard control units come with an output voltage of 110VDC.

Demagnetization cycles consist of a specific combination of positive and negative voltage pulse(s).

Note: The work piece material may retain some residual magnetism due to its chemical and magnetic properties.

Safety provisions:

SR interlock (safety) contact: This (or these) contact(s) will close when the magnetic device is properly magnetized and should be used to enable the operation of the connected machine.

Lock out signal (controls disabled): Without this 24V signal on E-X3-10 of the control board, the control unit cannot be operated. E.g. during machining or transport. By using a potential free relay contact driven by the machine's PLC, the controls can be enabled of disabled.

Control units are named by the combination of wattage and input/output voltage as follows:

EM-CU 150W-110VAC/110VDC	EM-CU 630W-230VAC/110VDC	EM-CU 630W-400VAC/110VDC
EM-CU 150W-230VAC/110VDC	EM-CU1250W-230VAC/110VDC	EM-CU1250W-400VAC/110VDC
	EM-CU 2500W-230VAC/110VDC	EM-CU 2500W-400VAC/110VDC

3.3 Compatibility with magnetic device

EM-CU control units have been designed to operate any 110VDC magnetic device within the specified wattage. In case of unknown magnetic device brands and models, do consult Walmag Magnetics.

3.4 Electrical features

		EM-CU 150W	EM-CU 150W	EM-CU 630W	EM-CU 1250W	EM-CU 2500W	EM-CU 630W	EM-CU 1250W	EM-CU 2500W	
Mains AC input voltage	[VAC]	110		200 -	- 230	380 - 460				
Output DC voltage	[VDC]	110		110				110		
Mains frequency	[Hz]	50/60		50,	60	50/60				
Operating temp.	[°C]	0 - 50		0-50				0 - 50		
Max. relative humidity	%	90		90				90		
Max. working altitude	[m]	1000	1000				1000			
Cabinet protection class	IP	IP66		IP	66		IP66			
Required circuit breaker	-	4A C curve	4A C curve	10A C curve	16A C curve	32A D curve	6A C curve	10A D curve	16A D curve	
Required cable (*)	mm²	3 G 1.5	3G1.5 3G2.5 3G2.5 3G4				3 G 2.5	3 G 2.5	3 G 2.5	
Remote control		No	No Yes Yes							
Embedded control		Yes	Yes		No			No		

(*) Cable between electrical grid and your control unit is not supplied. Make sure to follow required cable specifications.

3.5 Dimensions

Power (W))	EM-CU 150W	EM-CU 150W	EM-CU 630W	EM-CU 1250W	EM-CU 2500W	EM-CU 630W	EM-CU 1250W	EM-CU 2500W	
Input volt	age (VAC)	110		200 – 230				380 - 460		
Output vo	ltage (VDC)	110	110				110			
А	[mm]	300	300	300	400	400	400	400	400	
В	[mm]	200	200	250	300	300	300	400	400	
С	[mm]	120	120	150	150	150	200	200	200	
D	[mm]	280	280	250	350	350	350	350	350	
Е	[mm]	135	135	200	250	250	250	350	350	
F	[mm]	10,3	10,3					10,3		
G	[mm]	280	280	250	350	350	350	350	350	

Power (W))	EM-CU 150W	EM-CU EM-CU EM-CU 150W 630W 1250W 2500W				EM-CU 630W	EM-CU 1250W	EM-CU 2500W
Input volt	age (VAC)	110	200 - 230				380 - 460		
Output vo	ltage (VDC)	110	110				110		
Н	[mm]	180	180	200	250	250	250	350	350
I	[mm]	255	255	225	325	325	325	325	325
J	[mm]	155	155	175	225	225	225	325	325
К	[mm]	8	8					8	



E	ELECTRONIC MODULE
(T)	(TRANSFORMER)
CON2	EXTERNAL REMOTE SOCKET
SW1	MAINS SWITCH
Сх	POWER RELAYS
X1	MAIN TERMINAL BLOCK



Electronic module E:



E-SW1	DIP SWITCHES
E-X1	SUB D-9 MALE CONNECTOR
E-X2	9 PINS CONNECTOR
E-X3	TERMINAL BLOCK I/O SIGNALS
E-X4	TERMINAL BLOCK
X1	MAIN TERMINAL BLOCK

4 INSTALLATION

4.1 Inspection

Check the integrity of the packaging and its contents. Make sure that the goods are not damaged and correspond to the delivery documents. If anything is missing or damaged, please contact WALMAG MAGNETICS or your authorized supplier immediately.

4.2 Before starting the installation process

- Check that the input voltage matches the one indicated on the control unit label.
 - The control unit must be installed in a place complying with the specifications of paragraph 3.4.
 - Control units without enclosure must be installed inside a protected cabinet, protection class IP54 / NEMA12 at least.
 - Make sure the power is turned OFF before starting the installation.

4.3 Installation procedure

- A. Mount the control cabinet securely in the vertical position at a suitable location. See Dimensions.
 B. Connect the required circuit breaker and mains power cable to the control unit. See Electrical features. Do not turn the circuit breaker on yet. The mains line should be supplied through the machine. See attached WIRING DIAGRAMS.
 - C. In case of several control units connected to the same mains line, use different pairs of phases (L1/L2/L3) for each control unit.
 - D. Replace the bridge between E-X3, terminal 10 &7 of the 150 W and 630W unit or on X1 between terminals 4 & 5 of the 1250 and 2500 W units by an external, potential free relay contact driven by the machine's PLC. See attached schematics. Open = controls disabled / Closed = controls enabled. (Lock-out during the operation.)
 - E. Connect the safety contact terminals (150W and 630W unit: E-X3, terminals 1 & 2, 1250W and 2500W unit: X1, terminals 23 & 24)) to your machine's PLC. See attached WIRING DIAGRAMS. SR1 internal relay gets closed when circuit N°1 is magnetized. Consequently, terminals 1 & 2 (or 23 & 24) get electrically connected. (Interlock contact enabling the machine.)
 - F. Connect the magnetic device to the control unit, terminals 46 & 47.
 - G. Check and tighten all screw terminals on X1 main terminal block.

4.4 Setting the amperage threshold

Your control unit comes with a safety function which triggers the SR1 safety contact (E-X3, terminal 2). This function reads the amperage supplied to the magnetic device while magnetizing and compares it with a safety threshold which is set with the PCB DIP switches.

If the magnetizing current is higher than or equal to the threshold, SR1 contact gets closed which means that the device has been magnetized correctly.

The SR1 contact stays open if the device has not been properly magnetized (current too low).

Caution: Do note that at very low current levels, the required operating safety may not be provided.

In case of a delivery with a magnetic device or in case of a spare part, WALMAG MAGNETICS is supposed to deliver the control unit threshold already set. However, if you want to adapt the control unit to another size of magnet, please use the following table. It gives you the possible threshold steps according to the PCB DIP switches combinations.

Make sure the setting delivers the required clamping force by doing some preliminary tests.

Switch1	Switch2	Switch3	Switch4	Threshold Step
-	-	-	-	1
-	-	-	ON	2
-	-	ON	-	3
-	-	ON	ON	4
-	ON	-	-	5
-	ON	-	ON	6
-	ON	ON	-	7
-	ON	ON	ON	8

Switch1	Switch2	Switch3	Switch4	Threshold Step
ON	-	-	-	9
ON	-	-	ON	10
ON	-	ON	-	11
ON	-	ON	ON	12
ON	ON	-	-	13
ON	ON	-	ON	14
ON	ON	ON	-	15
ON	ON	ON	ON	16

5 REMOTE CONTROL

Optional U19 Remote Control

U19-P1



Embedded keyboard + potentiometr U19-P1 (EM-CU 150W)

6 OPERATION INSTRUCTIONS FOR EM-CU CONTROL UNITS

6.1 Safety

Before using the control unit, please read the user manual of the Walmag magnetic device carefully. Personal protection: Always wear safety shoes and safety glasses.

6.2 Getting started

Once wiring has been correctly made and carefully checked, turn the mains line power on. MAG_LIGHT & DEMAG_LIGHT start blinking simultaneously.

6.3 Magnetization

- Make sure the device's magnetic surface and the workpiece are cleaned properly.
- Make sure to remove burrs or lumps from the work piece to optimize the contact with the magnet.
- Place the workpiece onto the magnetic device's active surface.
- Make sure machine's PLC provides a closed contact (controls enabling) between E-X3 terminals 7 and 10. (1250 & 2500W: X1, terminals 4 and 5)
- Full magnetization: Variable magnetization:
 Push simultaneously UNLOCK_SWITCH and MAG_SWITCH for 0.5 seconds.
 Push and hold UNLOCK_SWITCH while pushing the MAG_SWITCH quickly 2 times.
 Adjust the clamping power with U19-P1 potentiometer (EM-CU >= 630W)

2b. Adjust the clamping power with the embedded potentiometer (EM-CU 150W)

- While magnetizing, LEDs blink until the magnetization cycle is over. See Light status summary.
- If the full magnetization cycle is successful (see chapter Setting the amperage threshold) the internal SR1 contact gets closed and MAG_LIGHT turns on.
- If the variable (partial) magnetization cycle is successful (see chapter Setting the amperage threshold) the internal SR1 contact gets closed and MAG_LIGHT starts blinking.
- If the magnetization has failed or is too low (see chapter Setting the amperage threshold), the internal SR1 contact gets opened and MAG_LIGHT starts flashing. Refer to TROUBLE SHOOTING chapter in order to fix the failure.
- The Magnetization sequence is done.

6.4 Demagnetization

- Make sure machine's PLC provides a closed contact (controls enabling) between E-X3 terminals 7 and 10. (1250 & 2500W: X1, terminals 4 and 5)
 - **1. Shutting off output voltage:** Push simultaneously UNLOCK_SWITCH and DEMAG_SWITCH for 0.5 seconds. LEDs blink until the output voltage is off.

Some residual remanence may remain and could make the workpiece sticky.

2. Demagnetization cycle start: Once again, push simultaneously UNLOCK_SWITCH and DEMAG_SWITCH for 0.5 seconds. While demagnetizing, LEDs blink until the demagnetization cycle is over.

- If the demagnetization cycle is successful (see chapter Setting the amperage threshold) the internal SR1 contact gets opened and DEMAG_LIGHT turns on.
- If the demagnetization cycle has failed (see chapter Setting the amperage threshold the internal SR1 contact gets opened and DEMAG_LIGHT start flashing. Refer to TROUBLE SHOOTING chapter in order to fix the failure.
- The Demagnetization sequence is done.

6.5 Signal specifications

In case of control from the machine's PLC (remote control disconnected), magnetization and demagnetization command signal times must be at least 150ms long. Maximum allowed voltage 24Vdc.

6.6 Light status summary

Control system status	MAG_LIGHT	DEMAG_LIGHT			
Control unit first switching on	Simultaneous blinking				
System failure	Simultaneous flashing				
While magnetizing or demagnetizing	Alternately blinking				
Device magnetized with full power (ON)	ON	OFF			
Device magnetized with variable power	Blinking	OFF			
Device demagnetized (OFF)	OFF	ON			
Magnetization failure	Flashing	OFF			
Demagnetization failure	OFF	Flashing			

Failures	Action
'At first switching ON, the signal lights of the remote control and PCB are off.	• Check status of the power supply.
'Upon first switching ON, the signal lights of the remote control are off and the leds of the PC board are on'	• Make sure the remote control & keyboard are correctly connected to the control unit.
'No reaction at all when the MAG_SWITCH or DEMAG_ SWITCH is pushed'	 Make sure to always push the UNLOCK- SWITCH together with either MAG_ or DEMAG_ SWITCH. Make sure to push both switches for at least 0.5 seconds. Check the connection and 24V signal between X3-7 & 10 terminals on the control board (or X1- 4&5 for 1250 and 2500W).
'External circuit breaker is tripping during the magnetization/demagnetization cycle.'	 Check the earth insulation and internal resistance of the magnetic device according to enclosed technical data sheet. Check power relays. If the magnetic device has a quick connector, check it for damages outside or humidity inside. If needed, make it dry
'Magnetic force is gradually decreasing'	• Check the condition of the magnetic device's active surface. If needed you can re-grind it. Ask us about the maximum wear distance.
'No holding force after a magnetization cycle and the green signal light is blinking.	 Check if the magnetic device is properly connected to 46x and 47x terminals.
'No release after a demagnetization cycle and the red signal light is blinking'	 Check the internal resistance of the magnetic device, according to enclosed technical data sheet.

8 PREVENTIVE MAINTENANCE

Interval	Worker	Task
Monthly	Qualified Electrician	Make sure the external cables and remote control are in a good shape. Replace damaged cables if necessary. Do a visual check of the controller components and take appropriate action if necessary.
Yearly	Qualified Electrician	Make sure that all screws of X1 terminal block are properly tightened. Remove any dust and foreign particles from the enclosure and the components.

R

9 ESSENTIAL SPARE PARTS

ITEM	EM-CU MODEL						
	150W	630W	1250W	2500W	630W	1250W	2500W
	110VAC	200-230VAC			380-460VAC		
	110VDC	110VDC			110VDC		
Control board	WALMAG 02-20-010						
Power board	WALMAG 02-20-037	WALMAG 02-20-011	WALMAG 02-20-012	WALMAG 02-20-014	WALMAG 02-20-011	WALMAG 02-20-012	WALMAG 02-20-014
Power relays	-	-	SCHNEIDER LC1D098BL	SCHNEIDER LC1D188BL	-	SCHNEIDER LC1D098BL	SCHNEIDER LC1D188BL
Transformer	-	-	-	-	BLOCK US- TE630/2X115	RS_PR0 RS_123-4241	RS_PRO RS_123-4243
Thyristor module	-		IXYS MCD- 26-16I01B	IXYS MCD- 56-08I01B	-	IXYS MCD- 26-16I01B	IXYS MCD- 56-08I01B

10 DECOMMISSIONING

10.1 Temporary decommissioning

- Turn the control unit off when the system is idle (no cycle is running).
- Shut off or unplug the mains power supply and disconnect the control unit from the mains.
- Disconnect the magnetic device's power supply cable(s) from the control unit.
- Clean up the whole unit, pack it and store it in a safe place with an ambient temperature between 0 and 40°C and low relative humidity.

10.2 Final decommissioning

- Plastic and non-ferrous parts must be scrapped separately.
- Electrical components in a good condition can be recycled.
- Respect the local rules and regulations about (electronic) waste disposal.



EMCU 150 W -110 VAC wiring



EMCU 630 W - 230 VAC wiring



EMCU 630 W - 400 VAC wiring



EMCU 1250 W and 2500 W - 200-230 VAC wiring



EMCU 1250 W and 2500 W - 200-480 VAC wiring



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