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ELAY 1000x6 Smart Tool | P/N: 81401247

Specifications

Featuring Variable Field Output (VFO) technology, this heavy lifter designed for crane use can be controlled using CANopen protocols to de-stack and pick single or multiple sheets. Adjustability of magnetic strength between 0 and 100% allows use of this mega magnet on both thin and thick sheets of varying sizes and material type. CANopen communication allows integration of multiple tools on the same CANopen bus, controlled simultaneously.

Maximum Breakaway Force [1,2]	6101 lb / 2768 kg
Maximum Shear [1,2]	Not Applicable / Recommended
Thickness for De-Stack [3]	Configurable With VFO
Nominal Supply Voltage	48 VDC
Peak Power Draw	4.96 A @ 48 VDC, 2 sec actuation time
Net Weight	130 lb / 59 kg
Connector Type	Male 7/8" - 5 pin - A-coded
Mounting Options	Dual Swivel Hoist Rings

Material Thickness - mm (in)	1.5 (0.06)	1.9 (0.07)	2.7 (0.11)	3 (0.12)	3.5 (0.14)	4.76 (0.19)	6.35 (0.25)	9.53 (0.38)	12.7 (0.50)	19.05 (0.75)	25.4 (1.00)	31.75 (1.25)	38.1 (1.50)	50.4 (1.98)
Maximum Force [1,2] - kg (lbs)	246.1 (542.6)	315.1 (694.7)	448.3 (988.3)	498.4 (1098.8)	549.7 (1211.9)	741.5 (1634.7)	1120.6 (2470.5)	1369.5 (3019.2)	1640.3 (3616.2)	2060.7 (4543.1)	2245.0 (4949.4)	2263.0 (4989.1)	2484.7 (5477.8)	2767.5 (6101.3)

$$SWL \ (Safe \ Working \ Load) = \frac{Maximum \ Force^{5}}{Safety \ Factor \ (\geq 3)}$$

[1] Determined in laboratory environment on SAE1018 Steel with surface roughness 63 micro inches with optimized pole shoes. Many factors contribute to the actual breakaway force and safe working load in each application. Consult a Magswitch Applications Engineer and test the Magswitch in each application before deployment.

[2] All data applies to unit with standard combination V/flat pole shoes installed.

[3] Determined with SAE1018 Steel L=200mm W=200mm.

[4] Values may vary by +/- 5%.

[5] Maximum forces listed above are not safe lifting forces. Designer must take into account safety factor when specifying tool. Magswitch recommends SWL = 3:1 for most lifting applications.

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Pole shoes required for operation

8800080	LAY70x6 Standard Pole Shoe Kit

WARNING!

Do Not Operate Unless In Contact With Ferrous Target!

[5.12] 130.06

[4.41] 112.00

[13.39] 340.00

[1.97] 50.00

[.75] 19.10

[15.75] 400.00

[12.56] 318.90

[10.55] 268.00

[1.18] 30.00

[19.40] 492.75

[20.50] 520.81

120°

[1.97] 50.14

[3.84] 97.60

BLACK = Primary working surface

GREY = Secondary working surface
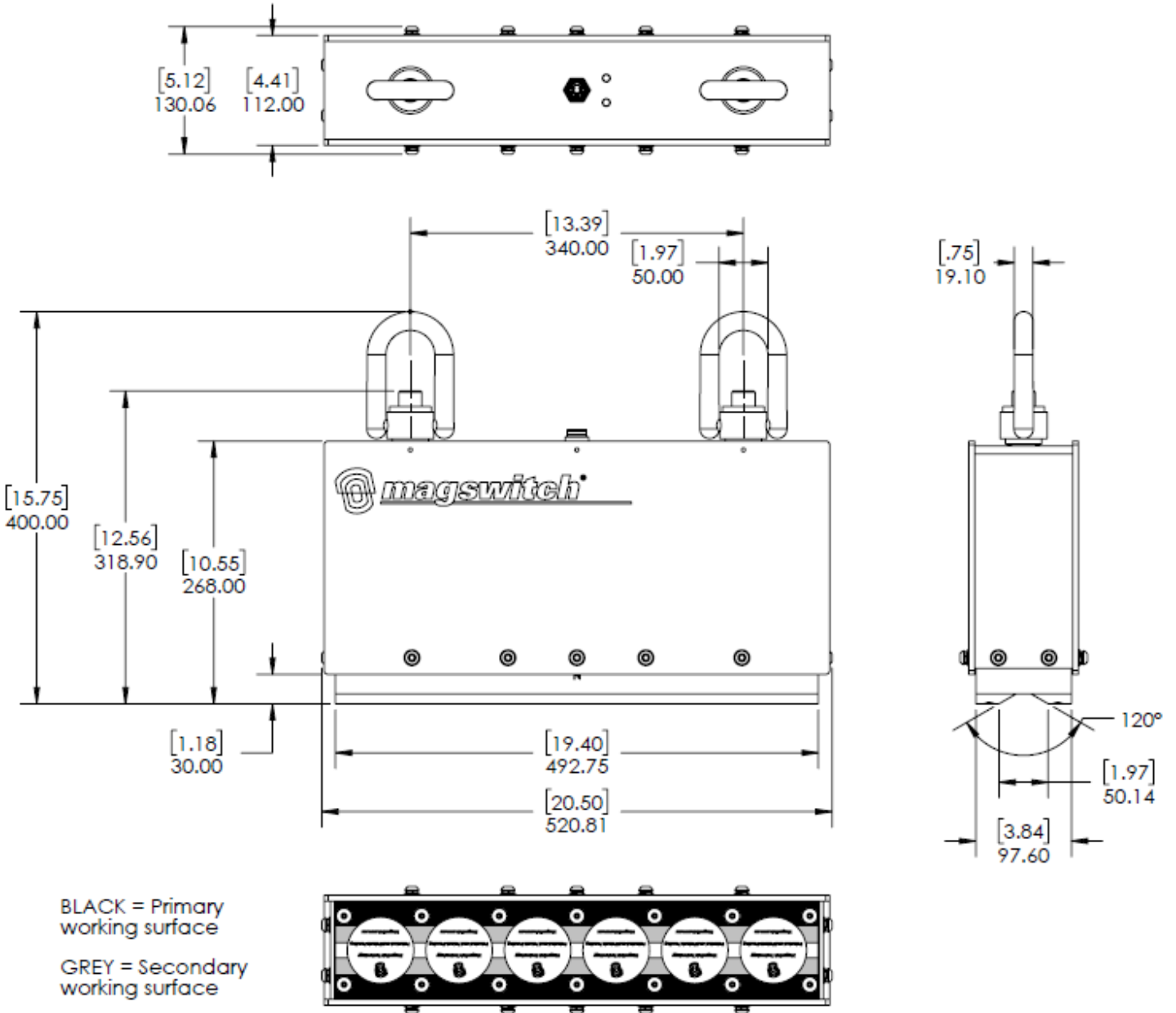
General Electrical Characteristics

| Parameter	Value
Input Voltage Range	48±5% V DC
Inrush Current (70 ms duration)	11.6 A DC @ 48 V DC
Rated Current Draw (Peak)	4.96 A DC @ 48 V DC
Rated Current Draw (Continuous)	0.325 A DC @ 48 V DC
Connector Style	Male 7/8" - 5 Pin - A-Coded

Ambient Conditions

Parameter	Range
Ambient Temperature (Operation)	-10 to +40 Degrees Celsius
Ambient Temperature (Storage)	-25 to +80 Degrees Celsius
Relative Humidity (non-condensing)	0 to 95%

LED Color Codes

LED #	LED Color	Status	Function
LED 1 (Power, Blue LED)	Blue	Off	No power to tool
		Solid	Power to tool
LED 2 (State, Green LED)	Green	Off	Magnet OFF or partially actuated
		Solid	

Connector Pinout

| Pin #	Function	Logic
1	Signal Shield / Earth	-
2	Vin (V+)	+24VDC
3	GND (V-)	GND
4	CANopen bus high	TX/RX high line (D1) (CAN_H)
5	CANopen bus low	TX/RX low line (D0) (CAN_L)
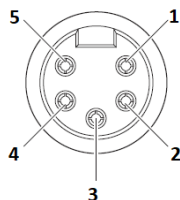
Cable Side: Pin Assignment 7/8", 5-pin, A-coded, Female Connector (socket-side) View

Tool side: Pin Assignment 7/8", 5-pin, A-coded, Male Connector (pin-side) View

CANopen Configuration Information

CAN Baud Rate	250 kBaud, configurable
Default CAN Node ID	$127_d = 7F_h$, configurable
Device Terminating Resistor	120 Ω **NOT** enabled Bus must have 120 Ω termination resistor installed
Master Device Termination	Master device must have line polarization/termination **OR:** Apply 450-650 Ω pull-up to +5V on high line (D1) (CAN_H) Apply 450-650 Ω pull-down to GND on low line (D0) (CAN_L)
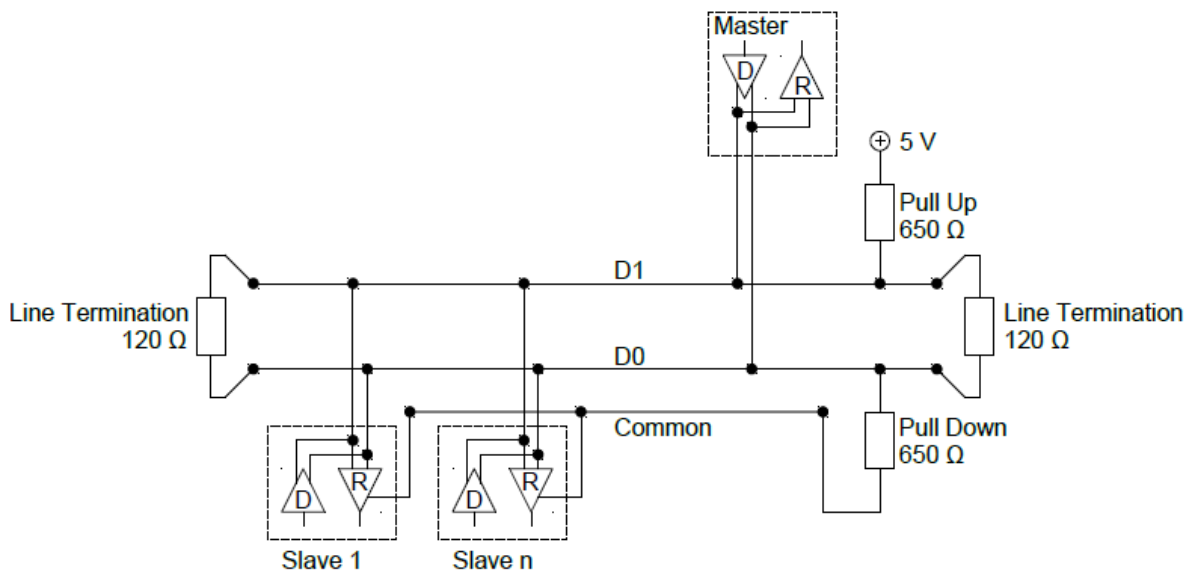
Changing CANopen NodeID

1. Check object 2009_h for current CANopen NodeID.
   a. Default NodeID $= 127_d = 7F_h$
2. Write desired NodeID value to 2009_h.
   a. Acceptable NodeID value range $= 1_d$-127_d
3. To save, write to object 1010_h sub-index 02_h the value 1702257011_d (65766173_h).
4. Wait until object 1010_h sub-index 02_h is equal to 1.
5. Disconnect and reconnect power.
6. The device NodeID will now be changed.

Changing CANopen Baud Rate

Please consult integration/assembly manual 1101334 for instructions on changing the CANopen baud rate. Available baud rates are 10, 20, 50, 125, 250, 500, and 1000 kBaud.
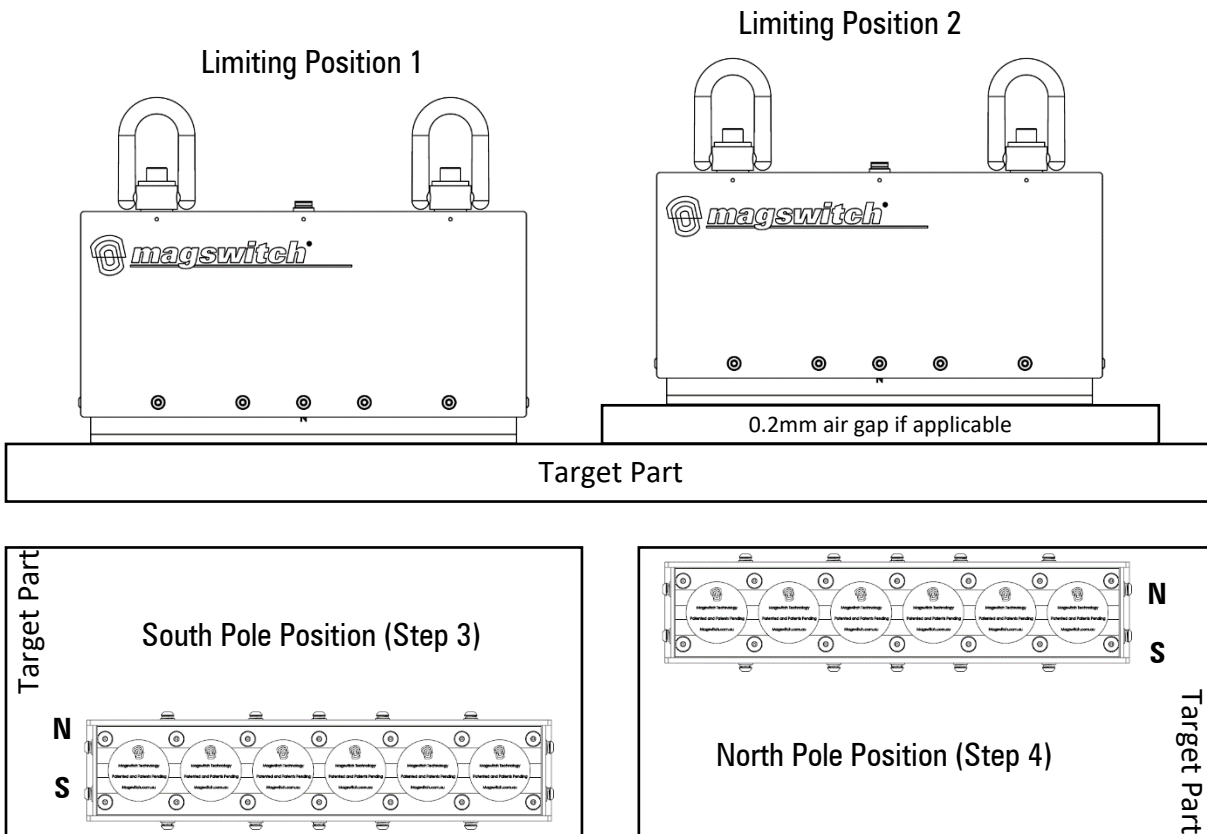
CANopen I/O Objects and Functionality

Type	Object (hex)	Sub Index (hex)	Short Name	Description (values in dec unless otherwise specified)
Inputs	2400	01	MoveEnable	1 = move home 2 = move to position set in 2400:02$_h$ **0 = reset to 0 after each move**
	2400	02	SetPosition	0-100 = 0-100% in increments of 1
	2400	03	CalTrigger	1 = trigger calibration mode 999 = exit & don't save **0 = reset trigger after setting 1 or 999**
	2400	04	CalSelect	0-3 = calibrations 0, 1, 2, 3
	2400	05	Sensitivity	0 = default -5, -10, -20 = more sensitive +5, +10, +20 = less sensitive
Outputs	2500	01	OutPos	0-100 = magnet position from 0-100% (Values <=2 are considered 0)
	2500	02	MagState	0 = Off 1 = 2%-99% Magnetic Strength (for de-stacking) 2 = 100% Magnetic Strength (safe for lifting)
	2500	03	CalState	0 = no S Pole, N Pole, or part present in range 1 = only North pole on 2 = only South Pole on 3 = both poles on, but no part present 4 = North, South, part present all within range
	2500	04	In Calibration	0 = not in Calibration 1 = in Calibration
	2500	05	CalStep	0 = not in calibration 1 = waiting for best circuit (Limiting Position 1) 2 = waiting for worst circuit (Limiting Position 2) 3 = waiting for South Pole Signal 4 = waiting for North Pole Signal
	2500	07	HomeStatus	1 = properly homed 0 = not properly homed
	2500	08	MoveStatus	1 = last set move complete 0 = last set move not complete
	2500	0B	Tool Type	30 = E30 50 = E50 307 = ELAY 30x7 505 = ELAY 50x5 706 = ELAY 1000x6
	2005		CANopen Baud Rate	84$_h$ = 132$_d$ = 125 kBaud by default. Consult configuration manual 1101334 before changing
	2009		CANopen Node ID	0-127 are permissible node IDs 7F$_h$ = 127$_d$ by default
	1001		Error Register	00$_h$-FF$_h$ or 0$_d$-255$_d$ depending on error

4-Step Calibration Procedure   See setup manual 1101334 for more E-series detail.

Step 1	Object **CalState (2500:03$_h$)** will return 4 when the contact quality
Limiting Position 1 for Calibration Match Signal	between both poles and the part lie within the zone created by bounded
Step 2	Limiting Position 1, Limiting Position 2, and North and South Pole
Limiting Position 2 for Calibration Match Signal	calibration signals.
Step 3	Object **CalState (2500:03$_h$)** will return 2, 3, or 4 if contact quality is
South Pole Position for South Pole Signal	equal to or better than the stored South Pole signal.
Step 4	Object **CalState (2500:03$_h$)** will return 1, 3, or 4 if contact quality is
North Pole Position for North Pole Signal	equal to or better than the stored North Pole signal.

Limiting Position 1

Limiting Position 2

0.2mm air gap if applicable

Target Part

Target Part

South Pole Position (Step 3)

N
S

North Pole Position (Step 4)

N
S

Target Part

The following flowchart shows the proper CANopen signaling required to enter and set calibrations 0-4. Note that all "output" objects can be polled at any time to determine the current state of the calibration process.

It is critical that the magnet be fully actuated (setPosition / OutPos = 100) at each calibration step to guarantee proper field values are stored.

The supplementary document 1101340 can be provided by Magswitch if additional information regarding calibration procedure is needed.

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ELAY70x6 Operational Flowchart

Required actions in black
Optional actions in yellow

power on

2400:01=1 → move home on command delay 5 seconds to finish homing procedure

2500:07 → Properly homed? — N → returns 0 / returns 1

Y

Tool is Homed

2400:01=0 → Reset MoveEnable

Standby

2400:04=0-3 → Select calibration preset 0,1,2,3

2400:03=1 1 second min → Calibration Triggered? — Y

N

2400:03=0 → Reset CalTrigger to 0

2400:05 → Read Sensitivity → returns value

2400:05=value → Set Sensitivity

Actuation

2400:01=0 → Reset MoveEnable

2400:02=0-100 → Set Position 0-100%

2400:01=2 → Move to Position

2500:08 → Move Complete? — N → returns 0 / returns 1

Y

2400:01=0 → Reset MoveEnable

2500:01 → Actuation Position → returns 0-100

2500:02 → Magnet State → returns 0,1,2

N - magnet is OFF or partly ON

Magnet State=2

Y - magnet is ON

2500:03 → Calibration State → returns 0,1,2,3,4

2500:04 → In Calibration → returns 0

2500:06 → Cycle Count → returns count

2500:09 → Serial Number → returns SN

2500:0A → Software Version → returns version

2500:0B → E-series Tool Type → returns 30,50,70

Calibration Mode

2400:03=0 → Reset CalTrigger to 0

2500:05 → Verify in calibration mode → returns 1

Actuation allowable

STEP 1
Position magnet on best part configuration:
- best surface contact
- least air gap (no coatings)
- most ferromagnetic material

2400:03=1 1 second min → Set "best circuit" calibration

2400:03=0 → Reset CalTrigger to 0

Actuation allowable

STEP 2
Position magnet on worst part configuration:
- rough surface contact
- max air gap (coatings)
- least ferromagnetic material

2400:03=1 1 second min → Set "worst circuit" calibration

2400:03=0 → Reset CalTrigger to 0

Actuation allowable

STEP 3
Position south pole as close to edge of part as allowed. South pole should not overhang edge. If not convenient, calibrate in same position as worst-case configuration (step 2)

2400:03=1 1 second min → Set south pole calibration

2400:03=0 → Reset CalTrigger to 0

Actuation allowable

STEP 4
Position north pole as close to edge of part as allowed. North pole should not overhang edge. If not convenient, calibrate in same position as worst-case configuration (step 2)

2400:03=1 1 second min → Set north pole calibration

2400:03=0 → Reset CalTrigger to 0

Calibration complete

2400:03=999 → Exit calibration without saving

2500:05 → Verify in calibration mode → returns 1

Calibration steps 1-4 MUST be completed when magnet state is ON. MagState 2500:02 must be equal to 2.