

CoBot SmartMagGrip E30 URCap Manual

Table of Contents

S. No.	Торіс	Page Number
1	Magswitch Gripper URCap Installation	2
2	Powering Magswitch Gripper from the CoBot	3
3	Configuring TCP/Payload	4
4	Magswitch Gripper URCap Installation Interface	7
5	Magswitch Gripper Calibration	11
6	Tool Orientation	12
7	Calibration Methods	13
8	Calibration Steps in Detail	14
9	Testing Calibration – Configuration 1 – Multi-Step Learn	22
10	Testing Calibration – Configuration 2 – Multi-Step Learn	24
11	Testing Calibration – Configuration 3 – Simple Learn/Multi-Step Learn	26
12	Using Magswitch Gripper and Magswitch Power Program Nodes	27



Magswitch Gripper URCap Installation

Open the settings menu and go to URCaps under the system tab.

		Settings	
> Preferences	Active URCaps	Inactive URCaps	
> Password	🕑 Remote TCP & Toolpath		
✓ System			
System Backup			
Robot Registration			
URCaps	UBCap Information	1	
Remote Control			
Constrained Freedrive			
Network			
Update			
> Security			
Exit	+ -		Restart

Fig 1: URCap Settings Menu

Select the "+" icon and load Magswitch Gripper URCap from the flash drive plugged into the cobot. Once the URCap is loaded, restart the system and verify that the Magswitch URcap is present under Active URCaps, this indicates successful installation.



Fig 2: Successful Installation of Magswitch Gripper URCap

For more detailed steps please refer the following link: <u>Universal_Robots_ROS_Driver/install_urcap_e_series.md at</u> <u>master · UniversalRobots/Universal_Robots_ROS_Driver · GitHub</u>



Powering Magswitch Gripper from the Cobot

To enable power and configure gripper using RS485 Modbus protocol, go to the installation tab, select Tool I/O and select MagswitchGripper from the Controlled by drop down menu.



Fig 3: Selecting Magswitch Gripper from Tool I/O

R		Univ	versal Robots Graphical Program	nming Enviro	nment				- + ×
Run	Program Installation		program < installation d	:unnamed>* efault*	New Open	Save		с с с с	≡
\mathbf{v}	General	I/O Interface Control							
	тср	Select how the Tool I/O interfa	ce is controlled. If a URCap cor	trols the inte	rface, user defi	ned options will b	e overridden.		
	Payload			1					
	Mounting	Controlled by	MagswitchGripper 🔹						
	I/O Setup	Analog Inputs - Communica	tion Interface	Digital O	utput Mode				
	Tool I/O								
	Variables	🔿 Analog Inputs		Tool Dig	ital Output mod	e is defined base	d on the tool atta	ached	
1.1	Startup	analog_in[2]	Voltage	Tool Out					_
	Smooth	analog_in[3]	Voltage 🔻	100100	pat voltage	24			
	Transition	Communication Interface		1 Setti	ng the tool volta	age to 24V may o d to 12V	lamage attached	equipm	ent
	Home				o only configure	o to it.			
	Conveyor Tracking	The Tool Communication with the tool without exte	Interface allows communication rnal wiring		al Pin Power 🚽		L Contraction of the second		
	Screwdriving	Baud Rate	19200 💌						
> 5	Safety	Parity	Even 💌	Star	ndard Output				
> •	eatures	Stop Bits	One 💌	Digi	tal Output 0				×
<u>ک</u> ا	-ieldbus	RX Idle Chars	1.5	Digi	tai Output 1				_
· > (JRCaps	TX Idle Chars	3.5						
0	Power off	Spe	ed 🦲 100)%		0	Simula	tion 🔵	

Fig 4: Magswitch Gripper Connected to Cobot

Note: If experiencing issues involving current, a possible solution would be to select "Dual Pin Power", see red arrow on Fig 4.

Omagswitch[®]

MAGSWITCH CoBot SmartMagGrip E30 URCap Manual + 1(303) 468.0662 magswitch.com

Configuring Tool Center Point (TCP)/ Payload

Select Installation then under the General tab select Payload. Set Payload to configure the tool Payload (shown below in Figure 5). Under the drop-down menu, select the configuration that pertains to desired payload (shown below in Figure 6). Note that this also selects the tool's center of gravity (COG). Detailed information about configurations can be found on figure 10.



Fig 5: Dropdown menu for configuring tool payload





Fig 6: Dropdown menu for configuring tool payload

Another way to set payload would be under the Installation tab. Select general and then TCP to configure the TCP (shown below in Figure 7). Under the drop-down menu, select the configuration that pertains to desired tool configuration.



Fig 7: Dropdown menu for configuring TCP

Under the Program tab, select basic and then Set Payload to configure the tool Payload (shown below in Figure 8). Under the drop-down menu, select the configuration that pertains to desired payload.



Fig 8: Dropdown menu for configuring tool payload

Omagswitch[®]

MAGSWITCH CoBot SmartMagGrip E30 URCap Manual + 1(303) 468.0662

magswitch.com



Fig 9: Magswitch gripper accessories



Fig 10: Configuration types for tool

Configuration Type A is when the eight-pinned connector on the wrist is aligned to the cable exit port on the CoBot SmartGrip E30 using the flat mount interface. Type B is when the 45° mounting plate is used and the cable exit port is closest to the eight-pinned connector. Type C also requires the 45° mounting plate but reversed tool mounting from type B.



Magswitch Gripper URCap Installation Interface

To enter the gripper URCap installation, go to <u>URCaps</u> and select Magswitch Gripper. When the gripper is powered off or there is an issue with the connection, all the buttons will be grayed out as shown in the image below.Note that URcap 1.1.6 is only compatible on Polyscope 5.11 and above.

		PROGRAM <unname< b=""> NSTALLATION default*</unname<>	d>* 😭 🛅 🔚	د د د د
> General	Magswitch Gripper			
> Safety	@ magazitab	0		
> Features	U agswitch			
> Fieldbus	Magswitch Controls	Cycles	Learning Controls	
VURCaps Magswitch	Home Magswitch	Magswitch Ready	Simple Learn	Learn Complete
Gripper	Turn Magswitch Full On	Magswitch Full On	Multi-Step Learn	Learning Step:
	Turn Magswitch Full Off	Magswitch Full Off	Cancel Learn	Learn Error
	Turn Magswitch Partial On	Magswitch Partial On	Learned Part:	Part Present
	Requested Position: 50 Act	ual Position:	Sensitivity: 0	N Pole On
	Enable Auto-Home: 🗹			S Pole On
Power off	Speed Caracteria	100%		Simulation

Fig 11: Magswitch Gripper Installation URCap when gripper is powered off

With the gripper powered on, the Home Magswitch button is active. The blue and green LEDs on the gripper will begin flashing to indicate that the gripper is not homed.

		PROGRAM <unname< b=""> INSTALLATION default</unname<>	:d>* 📑 📑 🖬	сс Ш
 General Safety 	Magswitch Gripper	h°		
Fieldbus	Magswitch Controls	Cycles	Learning Controls	
Magswitch Gripper	Home Magswitch	Magswitch Ready	Simple Learn	Learn Complete
Remote TCP & Toolpath	Turn Magswitch Full On	Magswitch Full On	Multi-Step Learn	Learn Error
	Turn Magswitch Partial On	Magswitch Partial On	Learned Part: 3	Part Present
	Requested Position: 50	Actual Position:	Sensitivity: 0	N Pole On
	Enable Auto-Home: 🗹			S Pole On
Normal	Speed C	100%	$\mathbf{b} \mathbf{O} \mathbf{O}$	Simulation

Fig 12: Magswitch Gripper Installation URCap when gripper is powered on



MAGSWITCH CoBot SmartMagGrip E30 URCap Manual

+ 1(303) 468.0662

magswitch.com

Once the gripper is homed, the rest of the buttons are no longer grayed out and the gripper can now be controlled from the buttons on the installation interface. The green indication LEDs indicate the various output signals sent by the gripper to the CoBot. The gripper can only be homed once after turning on. It needs to be rehomed if power to the tool is lost.

Run Program Installation	PROGRAM <unnamed>*</unnamed>
> General > Safety	Magswitch Gripper
 Features Fieldbus URCaps Magswitch Gripper Remote TCP & Toolpath 	Magswitch Controls 0 Cycles Learning Controls House Magswitch Wagswitch Ready Simple Learn Learning Step: 0 Turn Magswitch Full On Imagswitch Full On Imagswitch Full On Imagswitch Full On Turn Magswitch Partial On Imagswitch Partial On Imagswitch Partial On Imagswitch Partial On Imagswitch Partial On Requested Position: 50 Actual Position: 0 Imagswitch View Imagswitch View Imagswitch View Enable Auto-Home: Imagswitch Sold Imagswitch View Imagswitch View Imagswitch View Imagswitch View
Normal	Speed 100% CO O Simulation

Fig 13: Magswitch Gripper Installation URCap after gripper is homed

The below table shows functionality of various buttons and signals on the Magswitch Gripper Installation UI.

Type (from Gripper perspective)	Magswitch Gripper Installation Controls	Description	Control Type
Input	Home Magswitch	Sends command to home Magswitch Gripper **The gripper can only be homed once after turning on	Button
Input	Turn Magswitch Full On	Turn on Magswitch <u>to 100% ON</u>	Button
Input	Turn Magswitch Full Off	Turn off Magswitch to 0% 0N	Button
Input	Requested Position	Can be set to a position between 0 – 100.	Input Box
Input	Turn Magswitch Partial On	Sends command to turn magnet on to Requested Position	Button



MAGSWITCH

+ 1(303) 468.0662

magswitch.com

Type (from Gripper perspective)	Magswitch Gripper Installation Controls	Description	Control Type
Input	Enable Auto Home	If checked the gripper will home automatically at the beginning of the program if it was not homed previously	Check Box
Input	Simple Learn	Send command to perform Button simple learn	
Input	Multi Step Learn	Send command to perform multi Button step learn	
Input	Cancel Learn	Sends command to cancel calibration	Button
Input	Learned Part	Sends command to change calibration storage option (Calibration 0-3)	Drop Down Box
Input	Sensitivity	Sends command to change magnet sensitivity of part present Default = 0 Accepts values from -20 to 50 as input. "- "is more sensitive and decreases the acceptable range. "+" is less sensitive and increases the acceptable range.	Input Box
Output	Magswitch Ready	Indicates if Magswitch is Homed	Indication LED
Output	Magswitch Full On	Indicates if Magswitch is turned on at 100% position	Indication LED
Output	Magswitch Full Off	Indicates if Magswitch is turned off at 0% position	Indication LED
Output	Magswitch Partial On	Indicates if Magnet is partially on <u>– 2%-99% ON</u>	Indication LED



magswitch.com

Type (from Gripper perspective)	Magswitch Gripper Installation Controls	Description	Control Type
Output	Actual Position	Indicates actual position of the Magnet, value can be from 0 to 100%	Output Box
Output	Learn Complete	Indicates if gripper is calibrated	Indication LED
Output	Learn Step	 Indicates calibration step, 0 = not in calibration 1 = waiting for best circuit 2 = waiting for worst circuit 3 = waiting for south pole 4 = waiting for north pole 	Output Box
Output	Learn Error	Indicates error while performing calibration. Magnet was not fully on when trying to teach calibration step.	Indication LED
Output	Part Present	Indicates proper Part Present within range of selected learned part	Indication LED
Output	N Pole On	Indicates if North Pole is on	Indication LED
Output	S Pole On	Indicates if South Pole is on	Indication LED



Magswitch Gripper Calibration

Calibration Fundamentals

The gripper can be calibrated from the Magswitch Gripper Installation Interface, using Simple learn or Multi-Step learn. There are four calibration steps required to fully define magnetic field interaction between the tool and part and distinguish whether that interaction is sufficient or insufficient based on the user's configurations. Position of the tool's north and south poles relative to part edges and their proximity to the part during calibration steps govern whether poles are in adequate contact and whether the part is "present."

Learn complete indication LED will turn on when the tool is successfully calibrated for a particular calibration storage option (0-3).

North Pole indication LED will turn on only when the North Pole Position is in equal to or better contact than the stored North Pole Position.

South Pole indication LED will turn on only when the South Pole position is in equal to or better contact than the stored South Pole Position.

North Pole, South Pole and Part Present indication LEDs will turn on simultaneously only when the contact quality is between Limiting Position 1 and Limiting Position 2 *and* the North and South pole positions are in equal to or better contact than their respective stored positions.



Figure 14: Step 1-4 Calibration Positions

There are four separate calibration profiles which can be configured by following the calibration instructions in the next steps. It is important to select the calibration profile from the Learned Part drop down menu to values 0, 1, 2, or 3 before entering calibration mode to ensure a different calibration profile is not overwritten.



MAGSWITCH + 1(303) 468.0662magswitch.com

Tool Orientation



Fig 15: Tool Orientation for Magswitch CoBot SmartMagGrip E30 NOTE: Magnet Housing at the North Pole side of the tool has N marked on it NOTE: North Pole side of the tool is on the same side as the LED



Calibration Methods

This section has a brief description of the two calibration/learning methods for the CoBot SmartMagGrip E30 tool. The next section contains detailed steps for these two methods. Below are a few simple steps. Detailed steps can be found in the next section of the manual.

Multi-Step Learn/Calibration

Select Learned Part from Drop Down Menu

- 1. Turn magnet "ON" fully and issue Multi-Step Learn command. The learning step will be set to 1.
- 2. Turn magnet "ON" fully on Limiting Position 1 and issue Multi-Step Learn command. The Learning step will be set to 2.
- 3. Turn magnet "ON" fully on Limiting Position 2 and issue Multi-Step Learn command. The Learning step will be set to 3.
- 4. Turn magnet "ON" fully on South Pole Position and issue Multi-Step Learn command. The learning step will be set to 4.
- 5. Turn magnet "ON" fully on North Pole Position and issue Multi-Step Learn command. The learning step will be sent to 0 and Learn Complete LED will turn on.
- 6. The Multi-step learn process is now complete.

Use Multi Step Learn/Calibration in the following scenarios:

- 1. Bin Picking Applications
- 2. Parts with different surface conditions. I.e., Increase/decrease in surface roughness to the part that causes to increase/decrease the airgap.
- 3. If your best and worst case scenario are on different parts, so that one calibration (Learned Part) can be used for the entire range of parts.

Simple Learn/Calibration

Steps to perform for Simple Learn:

- 1. Place tool on the location of the part that needs to be calibrated.
- 2. Turn magnet "ON" fully (100% ON)
- 3. Upon issuing Simple Learn Command, the tool will automatically go through four steps of the simple learn process.

4. Learned Complete LED should turn on if simple learn completed successfully else, Learn Error indication LED will turn on if the magnet was not fully on when starting the Simple Learn process.

Use Simple Learn in the following scenarios:

- 1. Double blank/multiple sheet detection
- 2. Handling parts where best and worse are nearly similar and surface conditions do not very much between parts



Calibration Steps in Detail

Steps for Calibrating Gripper using Simple Learn

Step 1:

Select calibration storage option from the Learned Part drop down menu.

Run Program Installation	Magswitch Gripper		:d> 💽 🚰 📻 New Open Save	82
 Fieldbus 	Magswitch Controls	0 Cycles	Learning Controls	
VURCaps Magswitch Gripper	Home Magswitch	Magswitch Ready	Simple Learn	Learn Complete
Remote TCP & Toolpath	Turn Magswitch Full On	Magswitch Full On	Multi-Step Learn	Learning Step: 1
	Turn Magswitch Full Off	Magswitch Full Off	Cancel Learn	Part Present
	Requested Position: 50	Actual Position: 100	Sensitivity: 0	N Pole On
	Enable Auto-Home: 🗹		3	S Pole On
Normal	Speed 🥌	100%	\mathbf{D}	Simulation

Fig 16: Selecting Calibration storage option

Step 2:

Ensure that Gripper is present on the target and turn magnet full on at 100% position.

Step 3:

Press Simple Learn Button.

Step 4:

Wait for Learn Complete indication LED to turn on, which indicates that calibration is performed successfully. In the case that the calibration fails the Learn Error indication LED will turn on instead.

MAGSWITCH

CoBot SmartMagGrip E30 URCap Manual

+ 1(303) 468.0662 magswitch.com



nagswitch[®]

Fig 17: Simple Learn Complete

Steps for Calibrating Gripper using Multi-Step Learn

Step 1:

Select calibration storage option from the Learned Part drop down menu.

		PROGRAM <unnamed INSTALLATION default*</unnamed 	i>* [] [] [] New Open Save	8 2 3 7
 > General > Safety > Features > Fieldbus > VIBCase 	Magswitch Gripper	ch [*] ^{0 Cycles}	Learning Controls	
Magswitch Gripper Remote TCP & Toolpath	Frome Magswitch Turn Magswitch Full On Turn Magswitch Full Off Turn Magswitch Partial On	Magswitch Ready Magswitch Full On Magswitch Full Off Magswitch Partial On Actual Daphics 0	Simple Learn Multi-Step Learn Cancel Learn Learned Part: 0 Sensitivity: 0	Learn Complete Learning Step: 0 Complete Learn Error Part Present
	Enable Auto-Home:	Actual Position: 0	1 2 3	S Pole On
Normal	Speed 🥌	100%		Simulation

Fig 18: Selecting Calibration storage option



Step 2:

Ensure that gripper is present on the target in limiting position 1 and turn magnet full on. Some recommended positions are provided below.

- i. The maximum steel in vicinity (for complex or bin picking shapes)
- ii. The best contact
- iii. The least air gap
- iv. The maximum for one pole, but minimum for the other

NOTE: The unit is centered on the part with little to no air gap between the pole shoes and part.



Fig 19: Example of Limiting Position 1 for Calibrated Part Present Signal



Step 3:

Press Multi-Step Learn Button, the gripper blue LED will flash three times and Learning Step will display 1. This indicates Multi-Step Learn is initiated and is waiting for Limiting Position 1.

		PROGRAM <unname INSTALLATION default*</unname 	2d>* 📮 🗖 🗖	8 2 3 7
> General	Magswitch Gripper			
> Safety				
> Features	<u>ල magswite</u>	c n		
> Fieldbus	Magswitch Controls	1 Cycles	Learning Controls	
VURCaps Magswitch Gripper	Home Magswitch	Magswitch Ready	Simple Learn	Learn Complete
Remote TCP & Toolpath	Turn Magswitch Full On	O Magswitch Full On	Multi-Step Learn	Learning Step: 1
	Turn Magswitch Full Off	Magswitch Full Off	Cancel Learn	
	Turn Magswitch Partial On	Magswitch Partial On	Learned Part: 0	Part Present
	Requested Position: 9	Actual Position: 100		N Pole On
	Enable Auto-Home: 🗌			S Pole On
]	
Normal	Speed C	100%	\triangleright 0 0	Simulation

Fig 20: Multi-Step Learn initiated

Step 4:

Press Multi-Step Learn Button, the gripper blue LED will flash three times and Learning Step will display 2. This indicates that the gripper has stored Limiting Position 1 and is waiting for Limiting Position 2.

Run Program Installation	New 10 Log New. Open. Save. 3 /
 > Safety > Features > Fighting 	@ magswitch
VURCaps Magswitch Gripper Remote TCP & Toolpath	Hagswitch Controls Learning Controls Hermit Magswitch Full On Imagswitch Full On Turn Magswitch Full On Imagswitch Full On Turn Magswitch Full On Imagswitch Full On Turn Magswitch Full On Imagswitch Partial On Requested Position: Imagswitch Partial On Requested Position: Imagswitch Partial On Enable Auto-Home: Imagswitch Partial On
Normal	Speed100%

Fig 21: Mulit-Step Learn tool is calibrated for Limiting Position 1



Step 5:

- a. Turn off magnet, place gripper on the target in Limiting Position 2 and turn magnet full on. Some recommended positions are provided below.
 - The minimum steel in vicinity (for complex or bin picking shapes) i.
 - ii. The worst contact.
 - iii. The maximum allowable air gap (coatings)
 - iv. The minimum for one pole, but the maximum for the other

NOTE: The unit is centered on the part but an air gap of 0.2mm approximately equal to 2 layers of standard copy paper is added between the pole shoes and part. Artificial air gaps can be used to simulate scale, paint, or debris on a part but it is preferable to use the authentic "worst-case" allowable part condition rather than nonferrous shims.



Fig 22: Example of Limiting Position 2 for Calibrated Part Present Signal



Step 6:

Press Multi-Step Learn Button, the gripper blue LED will flash three times and Learning Step will display 3. This indicates that the gripper has stored Limiting Position 2 and is now waiting for the South Pole Position. In case of an error, the Learn Error LED will turn on.



Fig 23: Mulit-Step Learn tool is calibrated for Limiting Position 2

Step 7:

Turn off magnet, place gripper on the target in the desired position for South Pole Signal and turn magnet full on.



Fig 24: Example of South Pole Signal Position

Step 8:



MAGSWITCH

+ 1(303) 468.0662

magswitch.com

Press Multi-Step Learn Button, the gripper blue LED will flash three times and Learning Step will display 4. This indicates that the gripper has stored the South Pole Position and is waiting for the North Pole Position. In case of an error, the Learn Error LED will turn on.

		PROGRAM <unname< b=""> INSTALLATION default*</unname<>	:d>* 📮 📑 肩 New Open Save	8 2 3 7
🖒 General	Magswitch Gripper			
> Safety	6 magazita	l-°		
> Features	Unagswitch			
> Fieldbus	Magswitch Controls	1 Cycles	Learning Controls	
VURCaps Magswitch	Home Magswitch	Magswitch Ready	Simple Learn	Learn Complete
Remote TCP & Toolpath	Turn Magswitch Full On	Magswitch Full On	Multi-Step Learn	Learning Step: 4
	Turn Magswitch Full Off	Magswitch Full Off	Cancel Learn	Part Present
	Turn Magswitch Partial On	Magswitch Partial On	Learned Part: 0 Sensitivity: 0	N Pole On
	Enable Auto-Home:	Actual Fosicion, 199		S Pole On
O Normal	Speed 🥌	100%		Simulation

Fig 25: Multi-Step Learn tool is calibrated for Limiting Position 3

Step 9:

Turn off magnet, place gripper on the target in the desired position for the North Pole Signal and turn magnet full on.



Fig 26: Example of North Pole Signal Position



Step 10:

Press Multi-Step Learn Button, the gripper blue LED will flash three times, Learning Step will display 0, and Learn Complete LED will turn on when the process if finished. This indicates that the gripper has stored the North Pole Position and Multi-Step calibration is complete. In case of an error, the Learn Error LED will turn on.

Run Program	PROGRAM <unnamed>*</unnamed>
Run Program Installation > General > > > Safety > Feedures > Fieldbus ✓ URCaps Magswitch Gripper Remote TCP & Toolpath	Magswitch Gripper Magswitch Controls Magswitch Controls Magswitch Controls Magswitch Controls Magswitch Controls Magswitch Controls Magswitch Controls Magswitch Full On Turn Magswitch Full Off Turn Magswitch Partial On Magswitch Pa
Normal	Requested Position: 100 Enable Auto-Home: Speed

Fig 27: Multi-Step Learn complete



Testing Calibration – Configuration 1 – Multi-Step Learn

If the North Pole Signal and/or South Pole Signal Position are less than the minimum of the Calibrated Part Present signal range (this is the case for the calibration shown in this document):

- 1. Magnet is electrically de-actuated:
 - a. Magswitch Full On indication LED turns Off
 - b. Learning Step is shown as 0
- 2. Unit positioned within Calibrated Part Present signal range and the magnet is electrically actuated between 2% and 99%, by setting Requested Position as a value between 2 and 99 (Magnet 2%-99% ON):
 - a. Magswitch Partial On LED turns On
 - b. Check below table for the expected LED Indication values at this step

Indication LED	Value
S Pole On	Off
N Pole On	Off
Part Present	Off

- 3. Unit positioned within Calibrated Part Present signal range and the magnet is electrically actuated on (100%), by setting Requested Position = 100 (Magnet 100% ON) or issuing Turn Magswitch Full On command:
 - a. Magswitch Full On indication LED turns On
 - b. Check below table for the expected LED Indication values at this step

Indication LED	Value
S Pole On	On
N Pole On	On
Part Present	On

- 4. Unit positioned with South Pole outside of South Pole Signal range and the magnet is electrically actuated on (100%), by setting Requested Position = 100 (Magnet 100% ON) or issuing Turn Magswitch Full On command:
 - by setting requested Position = 100 (Magnet 100% ON) or issuing Turn Magsw
 - a. Magswitch Full On indication LED turns On
 - b. Check below table for the expected LED Indication values at this step

Indication LED	Value
S Pole On	Off
N Pole On	On
Part Present	Off

5. Unit positioned with North Pole outside of North Pole signal range and the magnet is electrically actuated on (100%), by setting Requested Position = 100 (Magnet 100% ON) or issuing Turn Magswitch Full On command:

Value

- a. Magswitch Full On indication LED turns On
- b. Check below table for the expected LED Indication values at this step

Indication LED



S Pole On	On
N Pole On	Off
Part Present	Off

- 6. Unit positioned with North/South Poles within South/North Pole Signal range and the magnet is electrically actuated on (100%), but not within Calibrated Part Present signal range, by setting Requested Position = 100 (Magnet 100% ON) or issuing Turn Magswitch Full On command:
 - a. Magswitch Full On indication LED turns On
 - b. Check below table for the expected LED Indication values at this step

Indication LED	Value
S Pole On	On
N Pole On	On
Part Present	Off

- 7. Unit positioned with neither pole within the Calibrated Part Present signal nor South/North Pole Signal range and the magnet is electrically actuated on (100%), by setting Requested Position = 100 (Magnet 100% ON) or issuing Turn Magswitch Full On command:
 - a. Magswitch Full On indication LED turns On
 - b. Check below table for the expected LED Indication values at this step

Indication LED	Value
S Pole On	Off
N Pole On	Off
Part Present	Off



Testing Calibration – Configuration 2 – Multi-Step Learn

If the South Pole Signal and North Pole Signal Position are equal to the minimum of the Calibrated Part Present signal range:

- Magnet is electrically de-actuated, by issuing Magswitch Full Off command:
 - a. Magswitch Full Off indication LED turns On
 - b. Check below table for the expected LED Indication values at this step

Indication LED	Value
S Pole On	Off
N Pole On	Off
Part Present	Off

- 2. Unit positioned within Calibrated Part Present signal range and the magnet is electrically actuated between 2% and 99%, by setting Requested Position as any value between 2 and 99(Magnet 2%-99% ON):
 - a. Magswitch Partial On indication LED Turns On
 - b. Check below table for the expected LED Indication values at this step

Indication LED	Value
S Pole On	Off
N Pole On	Off
Part Present	Off

- Unit positioned within Calibrated Part Present signal range and the magnet is electrically actuated on (100%), by setting 3. Requested Position = 100 (Magnet 100% ON) or issuing Turn Magswitch Full On command:
 - Magswitch Full On indication LED Turns On a.
 - Check below table for the expected LED Indication values at this step b.

Indication LED	Value
S Pole On	On
N Pole On	On
Part Present	On

- Unit positioned with South Pole outside of Calibrated Part Present signal range and the magnet is electrically actuated on 4. (100%), by setting Requested Position = 100 (Magnet 100% ON) or issuing Turn Magswitch Full On command:
 - a. Magswitch Full On indication LED Turns On
 - b. Check below table for the expected LED Indication values at this step

LED Indication	Value
S Pole On	Off
N Pole On	On
Part Present	Off



MAGSWITCH CoBot SmartMagGrip E30 URCap Manual

+ 1(303) 468.0662

magswitch.com

- 5. Unit positioned with North Pole outside of Calibrated Part Present signal range and the magnet is electrically actuated on (100%), by setting Requested Position = 100 (Magnet 100% ON) or issuing Turn Magswitch Full On command:
 - a. Magswitch Full On indication LED Turns On
 - b. Check below table for the expected LED Indication values at this step

LED Indication	Value
Input Word 2: Bit 9 (S Pole On)	On
Input Word 2: Bit 8 (N Pole On)	Off
Part Present	Off

- 6. Unit position with neither pole within the Calibrated Part Present signal range and the magnet is electrically actuated on (100%), by setting Requested Position = 100 (Magnet 100% ON) or issuing Turn Magswitch Full On command:
 - a. Magswitch Full On indication LED Turns On
 - b. Check below table for the expected LED Indication values at this step

Bit Number (Short Name)	Bit Return Value
S Pole On	Off
N Pole On	Off
Part Present	Off



Testing Calibration – Configuration 3 – Simple Learn/Multi-Step Learn

If Simple learn is used or Multi-Step Learn is done in such a way that all the steps were calibrated in a single position:

- Magnet is electrically de-actuated: 1.
 - a. Magswitch Full On indication LED turns Off
 - b. Learning Step returns 0
- Unit positioned within Calibrated Part Present signal range and the magnet is electrically actuated between 2% and 99%, by 2. setting Requested Position as a value between 2 and 99 (Magnet 2%-99% ON):
 - Magswitch Partial On indication LED turns On a.
 - Check below table for the expected LED Indication values at this step b.

LED Indication	Value
S Pole On	Off
N Pole On	Off
Part Present	Off

- 3. Unit positioned within Calibrated Part Present signal range and the magnet is electrically actuated on (100%), by setting Requested Position = 100 (Magnet 100% ON) or issuing Turn Magswitch Full On command:
 - Magswitch Full On indication LED turns On a.
 - b. Check below table for the expected LED Indication values at this step

LED Indication	Value
S Pole On	On
N Pole On	On
Part Present	On

- Unit positioned with North/South Poles within South/North Pole Signal range and the magnet is electrically actuated on (100%), 4. but not within Calibrated Part Present signal range %), by setting Requested Position = 100 (Magnet 100% ON) or issue Turn Magswitch Full On command
 - Magswitch Full On indication LED turns On a.
 - Check below table for the expected LED Indication values at this step b.

LED Indication	Value
S Pole On	On
N Pole On	On
Part Present	Off



Using Magswitch Gripper and Magswitch Power Program Nodes

Under the program tab select URCaps, the Magswitch gripper and Magswitch Power URCap should be visible.



Fig 28: Both URCaps should be visible under program tab

Magswitch Power:

Selecting this URCap turns the gripper on or off in the program as shown below. It is recommended to use the Magswitch power URCap only if the gripper is used with a tool changer. After switching the gripper off and turning it back on, it is recommended to provide a delay of at least 2 seconds before issuing the Magswitch Gripper URCap command to home the tool.



Fig 29: Magswitch Power Program Node URCap



Magswitch Gripper:

The Magswitch gripper URCap can be used to send commands to the gripper as well read the state of the gripper. The commands are summarized in the table below.

	PROGRAM <unnamed>*</unnamed> 📴 📅 🖬 C C C
> Basic	Command Graphics Variables
> Advanced 1 ▼ Robot Program > Templates 2 ■ Magswitch Gripper	Magswitch Gripper
VURCaps Magswitch Gripper Magswitch Power	Controls Controls
★ ♥ ♥ ♥ ■ i i i i	
Power off Speed	100% () () Simulation

Fig 30: Magswitch Gripper Program Node URCap

Magswitch Gripper URCap Program Node Command	Description
Home Magswitch	Sends Command to Home Magswitch Gripper (It is recommended to use the Auto Home feature instead of the Home Magswitch command if the gripper is not used with a tool changer)
Turn Magswitch Full On	Turn on Magswitch <u>to 100% ON</u>
Turn Magswitch Full Off	Turn off Magswitch <u>to 0% ON</u>
Requested Position	Can be set to a position between 0 – 100 %.
Turn Magswitch Partial On	Sends command to turn magnet on at requested position

MAGSWITCH CoBot SmartMagGrip E30 URCap Manual + 1(303) 468.0662

maa		nn.	nnm
וואווו	SVVII		сонн
11100	00000	U 11.	00111

Magswitch Gripper URCap Program Node Command	Description
Learned Part	Sends command to change calibration storage option (Calibration 0-3)
Sensitivity	Sends command to change magnet sensitivity Default = 0 Takes values from -20 to 50 as input
Read Gripper State Only	Reads the state of one or more variables associated with the gripper

List of variables that can be read using the read gripper state command is shown in the table below.

Variable	Description
ACTUAL_POS	Indicates actual position of the magnet, value can be from 0 to 100%
FULL_OFF	True if magnet is at 0% off position, else False
FULL_ON	True if magnet is at 100% on position, else False
HOMED	True if gripper is Homed, else False
N_POLE	True if North Pole on, else False
PARTIAL_ON	True if magnet is partial on, else False
PART_PRESENT	True if part present detected, else False
S_POLE	True if South Pole on, else False

Example Demonstrating Turn Magswitch Full On:

Commands can be sent to the gripper from the Magswitch Gripper URCap in the program. The below program example shows how to send command to turn the magnet on at 100% position.

MAGSWITCH

CoBot SmartMagGrip E30 URCap Manual

+ 1(303) 468.0662

magswitch.com



Fig 31: Example program to turn Magswitch Full On

agswitch[®]



Example Demonstrating Magswitch Gripper Read:

The state of one or more variables can be checked by placing the Read Gripper State command inside a loop. The below program example shows how to continuously check the state of the FULL_ON variable to verify that the magnet is turned on after sending the Turn Magswitch Full On command.



Fig 32: Using Loop to check the state of FULL_ON variable

/						4	Comma	ina	Graphi	s	variapies						
✓ Advanced	1	▼ Robot	Progra	m			Loon										
Loop	2	🗕 Mag	- L'	Гоор													
SubProg	3	ବ 🔁 Loop	Ø			F	lease sel	ect how r	many tim	es the pr	ogram in t	his loop	should be	•			
Assignment	4	<pre></pre>					executed.										
lf																	
Script																	
Event																	
<variable></variable>							Loop count Variable name										
ACTUAL_POS						ŀ		when ev	prossion	is Truo	LU	ор_т					
FULL_OFF								whenex	pression	f(v)						
FULL_ON																	
HOMED																	
Loop_1			_				_						_				
N_POLE				True	(HI)		False (LO)										
PARTIAL_ON							Esc										
PART_PRESENT			ar	nd		or.	vor pot 7 8				8	q	_				
READ_TEMP			u				_ ^		noc			Ĺ	Ĵ				
S_POLE			2	_	,				,	*			_	6			
<variable></variable>	•			Ŧ	(,			/			4	3	°			
Pose																	
<pose></pose>	▼		-		Ľ]	×	2	,	+		1	2	3	Submit		
Function																	
<function></function>	-		ABC						•				0	•			

Fig 33: Selecting FULL_ON variable from the list of variables



Fig 34: Loop until magnet is magnet is fully on



Fig 35: Read the state of the FULL_ON variable until True



Example Demonstrating Partial Magnet On:

The following program example turns on the magnet at 50% position and checks if the ACTUAL_POSITION variable returns a value of 50.

		PROGRAM <unnar< b=""> installation default</unnar<>	med>* 🔒	Open	Save		с с с с	
 > Basic > Advanced > Templates > URCaps 	1 ▼ Robot Program 2 - Magswitch Gripper - 50%	Q Command Magswitch	Graphics	Variabl	les	50		
Magswitch Gripper Magswitch Power		Magswitch Controls	9 7	с 8	< 9	.<		
Toolpath Move Remote TCP	0	Home I Turn Mage	Mags witch	5	6			
Move		Turn Mag	switch 0	2	3	8		
		Requested Posi	vitch					
	含果りぐ米 ■ 首 前		er state Only					
Normal	Speed 🥌	100%	C		D		Simulation	

Fig 36: Actuate Magnet at 50% On position

Run Program Installation			PROGRAM INSTALLATION	<unnamed>* default*</unnamed>	New	Open Save	÷ ۲ (
✔ Basic		۹	Commar	d Grap	phics	Variables	
Move Waypoint	1 V Robot Program 2 Magswitch Grip	per - 50%	Loop				
Direction Wait	3 • 2 Loop ACTUAL 4 ■ Magswitch G 5 ■ X Wait: 0.1	POS≠50 iripper: Read	Please sele executed.	t how many	times the p	program in this loop should	be
Set Popup				lways (times:			
Halt			Loop	ount	1	Variable name	
Folder	0		Loop v	0 hen express/	ion is <i>True</i>	Loop_1	
Set Payload					ACTUAL	_POS≠50	
> Advanced			🗖 Ch	eck expressio	on continuo	ously	
> Templates							
> URCaps							
	★ ♥ ゔ ♂ ¥	j 🖥 💼 🔤					
Power off		Speed	 1	00%	D	00	Simulation

Fig 37: Loop until ACTUAL_POS variable equals 50



Example Demonstrating Part Present:

The below program example demonstrates reading the part present signal inside a loop. While issuing the Magswitch Gripper read command ensure that the appropriate Learned part is selected from the drop-down menu.

	PROGRAM <unnamed>*</unnamed>
✓ Basic	Q Command Graphics Variables
Move Waypoint	1 Robot Program 2 Magswitch Gripper - 100%
Direction	3 P C Loop FULL_ON≠ True
Wait	4 Magswitch Gripper: Read
Set	6 P- C Loop PART_PRESENT≠ True Magswitch Controls Learning Controls
Popup	7 → Magswitch Gripper: Read
Halt	Home Magswitch Sensitivity: 0
Comment	Turn Magswitch Full On
Folder	
Set Payload	Turn Magswitch Full Off
> Advanced	Turn Magswitch Partial On
> Templates	
> URCaps	Requested Position: 50
Power off	Speed 100% D Simulation

Fig 38: Selecting Calibration profile for checking the status of PART_PRESENT variable



Fig 39: Loop until PART_PRESENT variable equals True