

Nuevas técnicas de automatización industrial

10th April 2025 tidyPal User Manual

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Overview



- 1 Introduction
- 2 Requirements
- 3 Elements
- 4 Functionalities
- 5 Axis configuration
- 6 Safety
- 7 Assembly and maintenance
- 8 Best practices
- 9 Support

Overview



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- 2 Requirements
- 3 Elements
- 4 Functionalities
- 5 Axis configuration
- 6 Safety
- 7 Assembly and maintenance
- 8 Best practices
- 9 Support

Introduction



?) What is tidyPal?

tidyPal is a solution made up of hardware and software, which allows the automation of the palletizing process.

With the software you can configure the different hardware components of the station such as pallet types, box types, robot I/O, work mode, etc. Also with the option to create the automatic mosaic.



Warning: we are not responsable for damage caused by misuse of this producto. An e-series robot is used int his manual, the software is not compatible with the CB series.

Introduction



Automatic mosaic

tidyPal is capable of working without the need to define the mosaic to be palletized by the user. The software will calculate the most optimal distribution both in stability and in use of space, you will only need the dimensions of the box and the pallet to be palletized.

Pallets:

- American pallet
- Euro pallet
- Half euro pallet



Dimensions:

- Width (W)
- Length (L)
- Height (H)







Automatic mosaic

The product has a graphical interface where you can configure the different parameters and functionalities.¹ Once set, at the beginning of the palletizing process, it will calculate the mosaic automatically and then start the process.

The result of the calculation algorithm will always be the same for a given configuration.





1 These functionalities will be explained later in the manual.

Introduction



Automatic mosaic

This section presents the distribution of layers obtained by the algorithm for a box with dimensions (W=200,L=300,H=200) mm and in a Euro pallet. The odd and even layers are shown below:



The algorithm will try to make the layers avoiding columns of boxes in the same position to obtain greater stability.

Overview



- 1 Introduction
- 2 Requirements
- 3 Elements
- 4 Functionalities
- 5 Axis configuration
- 6 Safety
- 7 Assembly and maintenance
- 8 Best practices
- 9 Support

Requirements

Product specifications tidyPal:

- Allowable box weight 10 Kg
- Maximum pallet height 2150 mm (from the ground)
- Station for two bays.
- American, Euro and Half pallet.
- Palletizing speed 6/10 boxes per minute*



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* Depending on the speed and accelearations configured for both the robot and the vertical axis.

Requirements



RTDE connection

This software uses the Real-Time Data Exchange (RTDE) protocol of Universal Robots to synchronize information necessary for the operation of URCap.

Below is a table with the registers in use:

Type of register	Numbers of registers
int_register	40,41,42
bit_register	66

Warning: verify that no other program or URCAP mentioned above to void possible interference that may cause the software to function incorrectly.

Overview



- 1 Introduction
- 2 Requirements
- 3 Elements
- 4 Functionalities
- 5 Axis configuration
- 6 Safety
- 7 Assembly and maintenance
- 8 Best practices
- 9 Support

Page 11

Elements

Product elements tidyPal:

- (1) Robot UR10e
- (2) Electric axis 1000 mm career
- (3) Festo motor driver CMMP-AS
- (4) Software URCap
- (5) Custom gripper
- (6) Signalling beacon
- (7) Frame
- (8) Control cabinet
- (9) Teachpendant
- (10) Connection plate
- (11) Emergency button
- (12) Pallet presence sensor
- (13) Safety Scanner (optional)



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Elements

Connection plate:

This section presents the connections available at the station:

- (1) Master switch
- (2) Supply
- (3) Air entry
- (4) Digital inputs
- (5) Extension input
- (6) Extension plate



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Elements



Custom gripper:

This section presents the gripper designed by Nutai S.L. for the palletizing process with which loads of up to 10 Kg* can be lifted.



* The maximum load of the claw will depend on the material to be handled, it will be necessary to carry out tests for each application.

Overview



- 1 Introduction
- 2 Requirements
- 3 Elements
- 4 Functionalities
- 5 Axis configuration
- 6 Safety
- 7 Assembly and maintenance
- 8 Best practices
- 9 Support



This section explains everything related to the functionalities of the URCap software. It is divided into the following subsections:

1. Program panel

Configuración de parámetros del modo de trabajo, estación y caja.

Parameters configuration of the work mode, station and box.

2. Toolbar panel

Diagnosis of the machine during the process.





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The program panel has 4 main nodes: *Palletized NUTAI, Station, Boxes y At each item*. (

		PROGRAM <unnamed>*</unnamed> INSTALLATION default*	New Open Save	
> Basic		Q Command Gr	raphics Variables	
> Advanced	1 Robot Program			
> Templates	2	tidyPal		
✔ URCaps	3 Station	Information		
Gripper Manager	5 9 ▼ For each item 6	tid	lyPal 🔲 🔍	€nutai
MAD CPOS		Start type		
MAD MOVE			0	0
RECDrive		New cycle	O Continue cycle	O Custom cycle
	0	Initial pallet	Right pa	let
		Number of boxe	es	_
		O Number of pallet	ts	
		O Continuous cycl	ling	
	▲ ♥ ♡ ♂ ೫ ₪ ඕ 前			
Power off	Speed 🥌	 100%		Simulation



Palletized NUTAI

You can configure from the NUTAI Palletizing node the different start modes of the station: New cycle, Continue cycle and Custom cycle (□).

		PROGRAM <unnamed>* 🛱 📑 🖬 🕼</unnamed>	۰ د د ا
 > Basic > Advanced 	1 Robot Program	Q Command Graphics Variables	
> Templates	2 🕈 🔻 Palletized NUTAI	tidyPal	
✔ URCaps	3 Station 4 Boxes	Information	
Gripper Manager	5	tidyPal 🗖 🛛 🔶 nutai	
MAD CPOS		Start type	
MAD MOVE			istana susla
tidyPal			Istom cycle
		Initial pallet Right pallet	•
		Box type EUR1_350x140x200_10CAP/	AS 🔻
		Number of boxes	
		O Number of pallets	
		O Continuous cycling	
	▲ ➡ つ ♂ w ■ 箇 面		
Power off	Speed		ation

□ Logos from product and company is also displayed.



Palletized NUTAI

The New cycle mode allows you to start a palletizing process with the possibility of working on demand for boxes, pallets or infinite. (

Run Program Installation		PROGRAM <unnamed>* 🛱 🚰 🖬 INSTALLATION default* New Open Save</unnamed>
> Basic		Q Command Graphics Variables
> Advanced	1 V Robot Program	
> Templates	2 ♥ ▼ Palletized NUTAI	tidyPai
V URCaps	4 Boxes	Information
Gripper Manager	5 P-▼ For each item	tidyPal 🗖 🔹 🖓 nutai
MAD CPOS	<empty></empty>	Start type
MAD MOVE		
RECDrive		New cycle O Continue cycle O Custom cycle
tiuyrai (i	0	Initial pallet Right pallet
		Box type EUR1 350x140x200 10CAPAS
		Number of boxes
		O Number of pallets
		O Continuous cycling
	▲ ➡ つ ♂ 米 ■ 箇 面	
Power off	Speed 🥌	

□ To set the infinite mode, select continuous cycling.



Palletized NUTAI

Other parameters that must be configured are the initial pallet and the type of box^1 (\Box)

Run Program Installation		PF INSTA	ROGRAM <unname< b=""> ILLATION default*</unname<>	i>* ∎	Open Save		R+	с с с с	≡
> Basic		۹	Command	Graphics	Variable	es			
> Templates	1 ▼ Robot Program 2 ♥ ▼ Palletized NUTAI		tidyPal						
✔ URCaps	4 - Boxes		Information						
Gripper Manager	5			tidyPal		С. Г	nutai		
MAD CPOS			Start type	-					
MAD MOVE			0		0		0		_
RECDrive			New cycle		O Continu	ie cycle	O	lustom c	ycle
tidyPal d	▲ ♣ つ ♂ X 連 直 面		Initial pallet Box type Number of Number of Continuous	boxes pallets s cycling		Right pallet EUR1_350x144	0x200_10CAF	PAS	
Power off	Speed		100%	C)	Simu	ation	

¹ In the Boxes node, later, it Will be explained how to define a type of box.



Palletized NUTAI

The Continue cycle mode should be used when the robot stops in the middle of a cycle for any reason such as machine failure, protection/emergency stop, power failure, etc.

To continue with the previous cycle, you must choose the pallet you were working on.(



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Palletized NUTAI

The custom cycle mode allows you to start palletising by any box and layer you need. To do this, the layer on which you are going to work and the first box to be positioned on that layer are configured.





Palletized NUTAI

Clicking on the information button will display an image explaining what data to provide to configure the layers and boxes.





Palletized NUTAI

In this node, to find more information about the software, click on the NUTAI logo and a pop-up (
) will appear.





Palletized NUTAI

The pop-up will display additional information about the software, such as its current version, whether it is up to date or the type of licence.





Station

In this node the different general parameters for the palletizing station are configured.

		PR(INSTAL	OGRAM <unname< b="">d LATION default</unname<>	j>* [] New	Open Save	LR+	
> Basic		۹	Command	Graphics	s Variables		
> Advanced	1 V Robot Program		Station co	nfigura	tion		
> Templates	2 P ▼ Palletized NUTAl		Station Co	inigura			
✓ URCaps	3 – Station 4 – Boxes		Pallets				
MAD CPOS	5 P For each item		Size		800 x 1200	mm EUR 1	•
tidyPal	<pre>empty></pre>		Height		mm		
Path			Path				
Recorder			Home point		Move here]	
		Ť	Tool				
			Activation out	put	digital_out[3] 🔹	•	
			Separator				
			Distance separ	ator	mm	Thickness	
			Adjust point		Adjust point	? Move her	e
			Position offset		X: Y:	mm	0
	▲ ♥ ♡ ♂ ₭ ₫ ₫ 面						
Normal	Speed 🥌		100%			Simulat	ion



Station

In the section of *Dimensions the type of pallet and the palletizing height must be configured.* (

			OGRAM <unnamed< b="">> LATION default</unnamed<>	,* L	Open Søve	
> Basic		ર	Command	Graphics	s Variables	
> Advanced	1 🔻 Robot Program		Station cor	figura	tion	
> Templates	2 ♥ ▼ Palletized NUTAI	1.	Station col	ingura		
✓ URCaps	4 - Boxes		Pallets			
MAD MOVE	5 • For each item		Size		800 x 120	0 mm EUR 1 💌
tidyPal	Cempty >		Height		mm	
Path		17	Path			
Recorder			Home point		Move here	
		Ť	Tool			
			Activation outp	ut	digital_out[3]	•
			Separator			
			Distance separat	or	mm	Thickness
			Adjust point		Adjust point	? Move here
			Position offset		X: Y:	mm 🚺
	▲ ╄ ७ ♂ ₭ 個 🗄 💼					
Normal	Speed Contraction		100%			Simulation



Station

In the Trajectory section, the robot can be positioned at the waypoint. (

		PROGRAM <unnam< b=""> INSTALLATION default</unnam<>	ed>* 📑 📑	Save	R+	с с с с
> Basic		Q Command	Graphics \	/ariables		
> Advanced	1 V Robot Program		<i>a</i>			
> Templates	2 🛛 🔻 Palletized NUTAI	Station c	onfiguration			
✓ URCaps	3 - Station 4 - Boxes	Pallets				
MAD CPOS	5 • T For each item	Size	800	x 1200	mm EUR 1	•
MAD MOVE	6 – – <empty></empty>	Height		mm		
tidyPal		Path				
Path Recorder		Facil				
		Home point	N	love here		
		Тооі				
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		Separator				
		Distance sepa	arator	mm	Thickness	
		Adjust point	Ac	ljust point	? Move he	ere
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	▲ ╄ ७ ♂ ₭ ₫ ₫ 面	1 🚍				
Normal	Speed 🥌	100%			Simul	ation



Station

In the Tool section, the digital output that will be used to control the action of the gripper must be configured. (

		PROGRAM <unnamed>*</unnamed>	
> Basic		Q Command Graphics	Variables
> Advanced	1 🔻 Robot Program	Station configurat	tion
> Templates	2 ♥ ▼ Palletized NUTAI	Station configura	
✔ URCaps	4 - Boxes	Pallets	
MAD CPOS	5 🛛 🔽 For each item	Size	800 x 1200 mm EUR 1 💌
	empty>	Height	mm
Path		Path	
Recorder		Home point	Move here
•		E L	
		1001	
		Activation output	digital_out[3] 🔻
		Separator	
		Distance separator	mm Thickness
		Adjust point	Adjust point ? Move here
		Position offset	X: Y: mm ()
Normal	Speed C	100%	Simulation



Station

In the Spacer section, the travel distance is configured, which is the maximum distance from the configurable point to the last available spacer and the thickness of the spacers.

		PR INSTA	ROGRAM <unname< b=""> ILLATION default</unname<>	i>* 1	Open Save	
> Basic		Q	Command	Graphics	s Variables	
> Advanced	1 v Robot Program	•	<u></u>			
> Templates	2 🛛 🔻 Palletized NUTAI		Station co	nfigura	ition	
✔ URCaps	3 - Station 4 - Boxes		Pallets			
MAD CPOS	5 🛛 🔻 For each item		Size		800 x 1200	mm EUR 1 🔻
MAD MOVE	6 – empty>		Height		mm	
tidyPal			Path			
Recorder			Home point		Move here]
			Tool			
			Activation out	out	digital_out[3] 🔹	•
			Separator			
			Distance separ	ator	mm	Thickness
			Adjust point		Adjust point	? Move here
			Position offset		X: Y:	mm 🚺
	▲ ╄ ७ ♂ ४ ₫ Ё 亩					
Normal	Speed 🥌		100%			Simulation

□ This section can be disabled using the checkbox.



Station

In addition, the pick-up point must be configured, this being the beginning of the stack of separators. Using the Move button here you can move the robot to the configured point(\Box).

		PF INSTA	ROGRAM <unname< b=""> ALLATION default</unname<>	j>* [] New	Open Save	K+	۰ ۰ ۱۱	
> Basic		۹	Command	Graphics	s Variables			
 > Advanced > Templates 	1 ▼ Robot Program 2 ∲ ▼ Palletized NUTAI		Station co	nfigura	tion			
✔ URCaps	3 Station 4 Boxes	I	 Station Boxes 	Pallets				
MAD CPOS MAD MOVE	5		Size		800 x 1200	0 mm EUR 1	-	
tidyPal			Height Path		mm		_	
Recorder			Home point		Move here			
		Ĩ	Tool					
			Activation out	put	digital_out[3]	▼		
			Separator					
			Distance separ	ator	mm	Thickness		
			Adjust point		Adjust point	Move h	ere	
			Position offset	:	X: Y:	mm	0	
	▲ ♥ ゔ ♂ X 単 首 m i							
O Normal	Speed Contraction		100%			Simu	lation	



Station

The following image shows the pick-up point and the distance that must be configured for the Separator section.





Station

Finally, the distances from the center of the spacer to the gripping point of the gripper must be configured.(□).

Ejecutar Programa Instalación		PRO INSTAI	GRAMA <sin nomb<br="">LACIÓN default*</sin>	re>*	Abrit Guardar	
> Básico		۹	Comando	Gráficos	Variables	
💙 Avanzado	1 v Programa de robot	_	Configura	ción do	ostación	
> Plantillas	2 Paletizado NUTAI		Configura	cion de	estacion	
✔ URCaps	4 – Cajas		Palets			
MAD CPOS	5 Por cada elemento		Tamaño		800 x 1200	mm Europalet 💌
tidyPal			Altura		mm	
Path Recorder			Trayectoria			
(1			Punto de hor	ne	Mover aquí]
	Ĩ	Herramienta				
			Salida activac	ión	digital_out[3] 🔹	·]
			Separador			
			Distancia reco	rido	mm	
			Ajustar punto		Ajustar punto	? Mover aquí
			Offset posició	ı	X: Y:	mm 🚺
	▲ ➡ ゔ ♂ X ■ 箇 面					
Normal	Velocidad		100%	5 (Simulación

□ The icon will display a pop up with extra information.



Station

Distance between the gripper with the separator and the center of the pallet layer.





Station

In manual mode, the data from the configuration¹ shall be loaded. The interface shall be updated with these parameters and the components shall be locked.



¹ In the Installation section, the configuration of the file is detailed.


Boxes

In this node the different general parameters will be completed to configure the different types of boxes.





Boxes

First, a list is shown with the different boxes with their parameters and configuration status. This list is expandable up to 15 types of boxes, to insert new boxes, the button will be used. + (\Box)





Boxes

In this section (**□**) the reference and dimensions of the box will be configured, as well as an Information button with a representative image of the box (**□**).



If you set the box size incorrectly, it may cause equipment malfunction.



Boxes

In this section (**D**) the weight of the box and its collection point are configured, as well as a button to position the robot in this same position.

Run Program Installation			OGRAM <unnamed .LATION default</unnamed 	>* [N	• • • • • • • • • • • • • • • • • • •	Save			III
> Basic	Q		Command	Grap	hics V	ariables			
 > Advanced > Templates 	1 ▼ Robot Program 2 ♥ ▼ Palletized NUTAI		Box config	urat	ion				
✔ URCaps	3 Station 4 Boxes		Box types (1	/ 15)					+
MAD CPOS	5 • ▼ For each item		Reference	•	Size (mm)	N N	/eight (kg)	Separator	
tidyPal	<pre>empty></pre>		Box 0		0x0x0		0.0	Non separator	^
Path Recorder									
٩)	Þ							*
			Reference		Box 0			Ø	
			Size			x	x	mm	0
		Г	Weight			kg			
		l	Catch point		Adjust	waypoir	nt ?	Move here	
	▲ ♥ ♡ ♂ ₭ ₫ ₫ 亩		Separator ea	ach		layers			
Normal	Speed C	_	100%		00			Simulation	



Boxes

In this section (**D**) it is selected if a separator is needed and every how many layers to position it.

		PROGRAM <unnamed> ALLATION default</unnamed>	>* 📑 📑 New Open S	ave		$\parallel \mid$
> Basic	۹	Command	Graphics Var	iables		
 > Advanced > Templates 	1 ▼ Robot Program 2 Ŷ ▼ Palletized NUTAI	Box config	uration			
✔ URCaps	3 - Station 4 - Boxes	Box types (1 /	(15)			+
MAD CPOS	5 ♥ ▼ For each item	Reference	Size (mm)	Weight (kg)	Separator	
MAD MOVE	6 empty>	Box 0	0x0x0	0.0	Non separator 🥊	^
Path Recorder					•	
(1		Þ				
						~
		Reference	Box 0		Ø	
		Size	×	x	mm	0
		Weight	k	g		
		Catch point	Adjust w	aypoint ?	Move here	
	▲ ♥ ♡ ♂ ₭ ₫ 箇 面 ञ	Separator ea	ch la	ayers		
Normal	Speed	100%	D 🔾	0	Simulation	



Boxes

In manual mode, you will only have a box with the parameters from the configuration file. As in the Station node, the components will be locked and updated with the parameters from the file.





At each item

In the node At each item you can configure the speed and acceleration of the movements. In addition, the nodes of the cycle will be generated using the Generate Sequence button. (



□ Tree of nodes generated by the URCap.



At each item

In the Sequence Parameters section, you can adjust the different speeds and accelerations of the process.





At each item

When selecting the information button, a pop-up will appear with the default parameters for a collaborative movement. (



* The collaborative movement values are indicative because they may change depending on the gripper, material to be handled, etc.







The toolbar panel shows the status of the machine during the work cycle as well as the status of the bays. (





A quick start of the work sequence is available. It is a quick access equivalent to the Nutai Palletizing program node. Any change in one of the panels will update the other simultaneously. (





In this section presents the different states of the toolbar:

MACHINE STATE	COLOUR	
STOPPED/WAITING BOOT	Off	
WORKING	Green	
WARNING M. CYCLING	Yellow	
WARNING M. BLOCKED	Orange	
FAILURE	Red	

BAY R/L	COLOUR	
NO PRESENCE	Off	
ЕМРТҮ	Green	
ACTIVE	Orange	
FULL	Red	

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Functionalities

This section presents the different states of the signaling beacon and the pilots in the palletizing station:







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Additional parameters for the palletising process can be configured in the installation panel. There are 4 sections: Parameters, RTDE Communication, Waypoints and I/O.





In the parameters section, different general parameters of the palletising process are configured.



Button to display pop-up message.



There are two working modes: Automatic in which the mosaic is calculated by algorithm and Manual in which the mosaic is fixed per file.





In manual mode the configuration file that has the necessary parameters for the sequence required by the client must be configured. In this mode the graphical interface of the programme node will automatically update and lock the already configured elements.





In the file selector will appear the files that we previously installed with the configuration file generated by the Pallet Builder application. Link:





The list of files installed and available for use is displayed here.





When selecting a configuration file, the parameters must be checked before applying them to the programme.





Two buttons are available:

- : will edit the name of the selected file.
- 💼 : will delete the selected file.





When deleting a file, a window will appear to confirm if you want to delete it.





Now that the configuration file has been presented, we will explain how to add new configuration files to the robot.

With the software developed by Nutai, Pallet Builder, a Zip file is generated with which we will follow the following steps:

- Unzip to the root of a USB flash drive.
- Insert the flash drive into the USB port of the teach pendant.
- Wait until the file is copied and the confirmation message appears.
- Make sure that the flash drive is in FAT32 format.



The pallet builder software and its different functionalities are shown below.

The first window allows you to configure the parameters of the box, such as length, width, height and weight.





In the following window, the pallet type and maximum palletising height are configured.





In the layers window, the mosaic is constructed by placing each box in the desired position. There are different functionalities such as add box, delete box, duplicate box and undo action.





In addition there are other functionalities applied to the layer such as duplicate layer, delete layer, align on X-axis and align on Y-axis.





In the last window, general information about the generated mosaic is displayed.

Box	Pallet	Layers	Result
Builder result			
Box size:	300x190x230 mm		
Number of boxes:	40		
Pallet type:	EUR 1 (1200x800 mm)		
Number of layers:	9 (5A 4B)	landa a	
Total height:	2086 mm		
Total weight:	320 kg	and and and	
Surface usage per layer:	24 % 30 %		
Total volume usage:	25 %		
	Download con	iguration	



Gaps can be configured to adjust the positioning of the enclosures. These gaps are applied in the movement prior to the final position of the box. (



Button to display pop-up message.



The *position gap* is the margin between boxes of the same layer. This is done to avoid collisions.





The *release gap* is the margin height between the position of the box and the height of the previous layer.





The *calibration of the axis* is carried out by taking two points of pick-up of the box at the same position and with two different positions of the vertical linear axis. (



Button to display pop-up message.



Axis configuration and movement will be discussed later in the manual in the section *Axis configuration*.





This section is for the control of the conveyor belt at the end of the line where the boxes arrive. A saturation time can be configured to stop the conveyor belt when the saturation sensor detects during this time and it can also be configured to detect any alarm coming from the conveyor belt.



Button to display pop-up message.


When you click on the ribbon icon, a pop up will appear with information about the parameters.





The reach and gripper rotation parameters allow the robot's reach to be limited in order to avoid forced movements and singularities.



Button to display pop-up message.



For a good performance it is recommended to select a value between 80 and 120 %.





Possibility of adding an independent movement to the robot by means of an additional cylinder.





Finally, the integrated vacuum switch can be configured.



Button to display pop-up message.



Configurable vertical axis starting point for greater reachability.

The vacuum switch provides information on the status of the enclosure during positioning.





In the I/O section, the digital inputs/outputs of the robot will be configured for the use of sensors and actuators. The two available panels are shown below.

	PROGRAM CUNNAMEDS La En La Victoria Contractor La	ur 📲 🚍	
> General	tidyPal		> General tidyPal
 > Safety > Features > Fieldbus 	tidyPal Universal palletising solution	nutai	Safety tidyPal tures Features Fieldbus tidyDal
VURCaps CobotVNC	Parameters 1/O Waypoints RTDE com. Orientation Home		CobotVNC Parameters 1/0 Waypoints RTDE com. Orientation Home
MAD Controller	Configure the different digital inputs and outputs of the robot.		MAD Configure the different digital inputs and outputs of the robot.
tidyPal	Box sensor digital_in(0) Box sensor digital_in(6) Box sensor digital_in(6)	▼	tidyPal G. pressure digital_out[2]
	Pallet R sensor digital_in[2] Pallet L sensor digital_in[3 Tool sensor digital_in[8] Pressure sensor digital_in[7]	▼ 10	Green beacon digital_out[5] Pilot R digital_out[6]
	Satur. sensor digital_in[1] Conveyor sensor digital_in[4]		Pilot L digital_out[7] Conveyor digital_out[0]
	Spin g. sensor digital_in(9) 🔻 🖬		spirighipper. bigita_out[1] ▼
	Inputs Outputs		Inputs Outputs 🚹
Power off	Speed	Simulation	Power off Speed \$100% D Simulation

Button to display pop-up message.



When configuring I/O, avoid repeating the same digital input or output for different functions to avoid malfunctions.





In the Waypoints section, the ends of the different types of pallets are configured to reference them in the system.

					PRC INSTALL)GRAM <unna< b=""> ,ATION default</unna<>	med>	Open Save		R+ 🚦	2
>	General	tidyPal									
>	Safety	tidyPal									.+ -; i
>	Features	Universal pall	etisina sol	lution							ILAI
>	Fieldbus		cost ing sol								
\sim	URCaps	D			18/	DTD					
	CobotVNC	Paramete	rs	1/0	vvaypoint	IS RIDE	com. Orio	entation	Home		
	MAD Controller	Move the rob	ot to the	ends of the pa	allet you want	to work on a	and save the poi	ints.			
	RECDrive	L oft mallet					Dight pallet				
	tidyPal	Leit pallet					Right pallet				
		WP12	Adjust	t waypoint	Mov	e here	WP11	Adjust	waypoint	Move here	
		WP22	Adjust	t waypoint	Mov	re here	WP21	Adjust	waypoint	Move here	:
		WP32	Adjust	t waypoint	Mov	re here	WP31	Adjust	waypoint	Move here	:
									_	-	
				EL	JR 1	EUR 2	EUR 6	Cust	om 🚹		
										-	
6	Dower off			Speed .		100	× -			Simulatio	
C	Power off			speed 드		100%				Simulatio	

Button to display pop-up message.



The message shows the points where the robot tool should be placed to obtain the points.





In the RTDE Communication section, the offsets for the RTDE communication registers shall be configured.





In addition, we will have two additional windows with advanced parameters, Orientation and Home. To display these parameters, press the tidyPal logo for 3 seconds (□).





By default, the orientations will be factory set but can be changed by taking a point with the robot with the gripper orientation in the desired position.

			PROGRAM <un INSTALLATION defa</un 	named>	pen Save	a III
> General	tidyPal					
> Safety	tidyPal					
> Features		olution				
> Fieldbus						
✔ URCaps	Parameters	1/0	Waypoints BT	DE com	tation Home	
RS485	i uluneter s	1,0	waypoints nin		home	
MAD Controller	Adjust different points	s with the gripper	above the pallets to o	onfigure the oriental	tion position.	
tidyPal	Left pallet Right pallet					
	North Adjus	st waypoint	Move here	North	Adjust waypoint	Move here
	East Adjus	st waypoint	Move here	East	Adjust waypoint	Move here
	South Adjus	st waypoint	Move here	South	Adjust waypoint	Move here
	West Adjus	st waypoint	Move here	West	Adjust waypoint	Move here
				0		
Normal		Speed 🥌		0%	$\mathbf{O} \ \mathbf{O}$	Simulation



The following image shows the positions necessary to obtain the correct orientation.





In the last window you can configure the different waypoints of the robot. These are points to ensure a safe trajectory and avoid collisions.

Run Program	PROGRAM <unnamed> 📴 🔚 🔜</unnamed>	
🖒 General	tidyPal	
> Safety	tidyPal	
> Features		
> Fieldbus		
✓ URCaps	Deventer 1/0 Warnsiste DTDE even Orientation Unite	
RS485	Parameters I/O Waypoints RIDE com. Orientation Home	
MAD Controller	Adjust the different points to configure the home waypoints.	
tidyPal		
	Home Adjust waypoint Move here	
	Right home Adjust waypoint Move here	
	Left home Adjust waypoint Move here	
^		
Normal	Speed100% 🕞 🚺 🕕	Simulation

Overview



- 1 Introduction
- 2 Requirements
- 3 Elements
- 4 Functionalities
- 5 Axis configuration
- 6 Safety
- 7 Assembly and maintenance
- 8 Best practices
- 9 Support



In this section, the URCap **MAD Controller**¹ Will be shown, which will allow us to control the vertical axis of the palletizer. In addition, its different functionalities will be explained, such as axis status and parameters.

With this software you can move up to 4 axes towards points or coordinates in a simple and programming-free way, without the need for other external components such as PLC/HMI.



¹ See all the details about the URCAP in its manual: <u>http://nutai.com/urcaps/madcontroller/urcap-user-manual-es.pdf</u>



You can configure all the features of the URCap from the installation panel. This window has 3 tabs (\Box): Axes, Parameters and Points:

		PROGRAM <unnamed></unnamed> INSTALLATION default*	New Open 5	Save	
> General	MAD Controller				
> Safety					
> Features	Multi Axis Drive	5			
> Fieldbus				Axis Paramet	ers Points
✔ URCaps					
CobotVNC					
MAD Controller		Select the nu	imber of axis		
		1	•		
			Axis 1		
		IP address:	192.168.0.1		
		Port:	502		
		Units:	mm 🔻		
			4.5		
		Apply	((ဂု)) Scan		
Power off	Speed 🥌	100%		0	Simulation

□ The information of the configured axes is also displayed: their status and their current position.



From the Axes tab you can select the number of axes you want to work with, assigning each one its IP address, port and position units. In the case of the tidyPal we will only need 1 axis.

		PROGRAM <unnamed: INSTALLATION default*</unnamed: 	New Open Sav		
> General	MAD Controller				
> Safety					
> Features	Multi Axis Drive	a 1 8,05			
> Fieldbus		m	A	kis Parameters	Points
✓ URCaps					
CobotVNC					
MAD Controller		Select the n	umber of axis		
		1	•		
		_	Axis 1		
		IP address:	192.168.0.1		
		Port:	502		
		Units:	mm 🔻		
			(4. 3)		
		Apply	(((ဂု))) Scan		
	1		-		
Power off	Speed 🤇	100%		Sin	

Once the axes have beeen indicated, press the Apply button to connect¹ or reconnect to them.



From the Parameters tab you can consult —Read button— and configure —Write button— (□) the most common parameters of the controller.

		PROGRAM <unnamed></unnamed> INSTALLATION default*	New Open	Save	K+	9423 — 15D1 —		
> General	MAD Controller							
> Safety							╵┍	
> Features	Multi Axis Drive							Select a parameter
> Fieldbus	mm			Axis	Parameters	Points		
V URCaps								
CobotVNC					Other	params		Positioning Velocity
MAD						paramo		Jog Velocity (Phase 1)
Controller		Select a parameter					ocit	^{ty} Jog Velocity (Phase 2)
	Positioning	/elocity	•		Reduced M	lode 🕕		Software End Positions
					Enable:	S		Positioning Acceleration
	Velocity (mm/s):		500.0		Speed (%): 20		Positioning Deceleration
								Positionina Torque Limit
					Home			Maximum motor current
					Set Ho	me here		Read 🕞 Write
		Read 🕞 W	rite		Move	to Home		
Power off		CSpeed 100%	-		C O sim	nulation		

Warning: modifying the parameters will affect the operation of its components. All parameters (except Reduced Mode) are saved in the motor controller and not in the installation file.



Description of the main configuration parameters:

- 1. Positioning speed: base speed for positioning tasks in direct mode no Jog (limited to the maximum speed allowed).
- 2. Jog speed (phase 1): maximum speed in manual mode (Jog) during the initial phase (limited to the maximum speed allowed).
- **3.** Jog speed (phase 2): maximum speed in manual mode (Jog) during the final phase (limited to the maximum speed allowed).
- **4.** Software position limits: minimum and maximum final position by software (not limited). Plausibility rule: Lower bound ≤ Upper bound.



Description of the main configuration parameters:

- **5. Positioning Acceleration:** Acceleration for direct mode positioning tasks (limited to maximum allowable acceleration).
- **6. Positioning Deceleration:** Deceleration for direct mode positioning tasks (limited to maximum allowable acceleration).
- **7. Positioning torque limit:** torque limit in mNm (not limited). If the axis exceeds this limit, it goes into fault. Value 0 disables torque limitation.



IMPORTANT: Changes to any parameter will only persist until the next reboot. For permanent changes, press the Save button (□).

			PROGRAM <unnamed></unnamed> INSTALLATION default*	New	Open	Save	№ ⁹⁴²³ —
> General	MAD Controller						
> Safety							
> Features	Multi Axis Drive	Axis 1 -155.97					
> Fieldbus		mm				Axis	Parameters Points
✓ URCaps							
CobotVNC							Other params
MAD Controller			Select a parameter				
							Reduced Mode
		FOSICIONING VE	socity	•			
						_	Enable: M
	Velocity	(mm/s):		500.0			Speed (%): 20
							Home
							Set Home here
	[Re Re	ead 🕞 V	Vrite			Move to Home
Power off			Speed 100%	-			Simulation

Warning: Reading, writing and saving of parameters in the controller may not work correctly inc ase these are any active warnings or errors int he motor controller (which you can consult from the Toolbar).



It is possible to enable and configure the speed of the axes in Reduced mode (□). By enabling this option, if the robot is in Reduced Mode, the maximum positioning speed of the axes will be limited to the configured percentage.



Warning: Will apply to all axes ans not just the selected axis. This software functionality does not replace the SLS safety function (Safe Limited Speed, EN 61800-5-2) of the axis, which would require the CAMC-G-S3 safety module.



You can set the current position as Home (□) by using the Set Home Here button¹. □ Clicking on Move to Home will move the axis to the current zero position.

		PROGRAM <unnamed></unnamed> INSTALLATION default*	New Open.	Save	I ⁹⁴²³ Ⅲ
> General	MAD Controller				
> Safety					
> Features	Multi Axis Drive				
> Fieldbus				Axis	Parameters Points
✔ URCaps					
CobotVNC					Other params
MAD Controller		Select a parameter			
	Positioning	/elocity 🔻			Reduced Mode
					Enable: 🗹
	Velocity (mm/s):		500.0		Speed (%): 20
					Home
					Set Home here
		Read 🕞 W	rite		Move to Home
Power off		Speed 100%	-	C	

¹ For more information consult MAD Controller manual.



From this tab it is possible to move the selected axis in manual mode with the Jog (
buttons. In addition, it is possible to save points although this is not necessary for the tidyPal process.

		≮ ⊾og		RAM <unnamed></unnamed> TION default*	D New Open S	Save	LR+	9423 15D1	
> General	MAD Controlle	er							
> Safety									
> Features	Multi	Axis Drive	-155.97						
> Fieldbus			mm			Axis	Parameters	Points	
✔ URCaps		Point No	Description	Position (mm)	Teach		Move		
CobotVNC MAD	â	P1	Р1	-155.97	Teach P	1	Move to P1		^
Controller	Ŵ	P2			Teach P	2	Move to P2		
	Î	P3] -	Teach P	3	Move to P3		
	Ŵ	P4			Teach P	4	Move to P4		
	Î	P5] -	Teach P	5	Move to P5		
	Î	P6			Teach P	6	Move to P6		
	Î	P7] -	Teach P	7	Move to P7		~
		•	Jog -	ıg +	< Pag	je -	> Page +		
Power off				Speed 100%	-•	D	C O sirr	nulation	



You can access the URCap toolbar¹ from any window (\Box) to check the status of the controller and move the axis manually using Jog (\Box).

		PROG INSTALLA	RAM <unnamed> TION default*</unnamed>	New Open Save	
> General	MAD Controller			CobotVNC	Multi Axis Drive
 > Safety > Features > Fieldbus 		Ve -155.97 mm		Ax	is 1
VURCaps	Point N	Description	Position (mm)	Enable	
MAD	р1	Pl	-155.97	Stop Ready	
	1 P2		-	O Mov. completed	
	рз		- [Warning	
	m P4] -	Position: -155.97 mm Speed: 0%	
	<u>т</u> Р5		-		
	1 P6			IP Addr.: 192.168.0.10 Pe Ready FSM: S4 Position F	ort: 502 SM: SA1
	<u>т</u> Р7] -	Jog -	Jog +
		Jog -	og +		
Power off			Speed 100%	- 0 (3 O Simulation

¹ The toolbar is only available on e-Series models.

Overview



- 1 Introduction
- 2 Requirements
- 3 Elements
- 4 Functionalities
- 5 Axis configuration
- 6 Safety
 - 7 Assembly and maintenance
- 8 Best practices



Page 100

Safety



This section explains everything related to the safety of the palletising station:

1. Impact test

Validation of robot force and pressure.

2. Integration recommendations

Configuration-dependent aspects of product integration.

Safety





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This section presents the conditions when performing the impact test with the Nutai gripper. This process has been carried out in accordance with ISO/TS 15066 to certify that the equipment meets the force and pressure requirements.

Detailed test results are presented in Annex I.

Conditions:

Gripper	Ang. Speed	Ang. Acce.	Lin. Speed	Lin. Acce.
Nutai	180 °/s	800 °/s ²	1750 mm/s	9000 mm/s ²

Safety



The following images show the process of carrying out the impact test. For this purpose, the KMG-500 force sensor and Fuji Prescale paper were used.





Safety



2 Integration recommendations

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The integration will depend on the customer's requirements, therefore, there may be different configurations for the station.

The following are some integration schemes depending on the level of security required:

- 1. Basic level: the station is in a fenced area. Both are stopped if the operator enters the fenced area.
- 2. Medium level: the station is NOT in a fenced area. The robot slows down if the operator enters the operating area.
- **3.** Advanced level: the station is NOT in a fenced area. The robot and/or axis slows down or stops if the operator enters the operating area.

Safety



1. Basic level: the station is in a fenced area. Both are stopped if the operator enters the fenced area.



Connection diagram

Warning: these slides are safety recommendations only. We are not responsible for damage caused by misuse or incorrect integration of this product.

Safety



1. Basic level: the station is in a fenced area. Both are stopped if the operator enters the fenced area.



Integration scheme

Warning: these slides are safety recommendations only. We are not responsable for damage caused by misuse or incorrect integration of this product.
Safety



1. Basic level: a possible integration with the fence is shown below. In this mode, when the operator enters the working area, the robot and axis will stop.







2. Medium level: the station is NOT in a fenced area. The robot and axis stop if the operator enters the operating area.



Connection diagram

Safety



2. Medium level: the station is NOT in a fenced area. When the operator enters the restricted area, the robot slows down, the linear axis will maintain its speed because mechanically it is already limited to a collaborative speed.







3. Advanced level: the station is NOT in a fenced area. The robot and axis slow down if the operator enters the operating area.



Connection diagram

Safety



3. Advanced level: the station is NOT in a fenced area. A detection in the first zone will slow down the robot, in the second zone robot and axis will stop.



Overview



- 1 Introduction
- 2 Requirements
- 3 Elements
- 4 Functionalities
- 5 Axis configuration
- 6 Safety
- 7 Assembly and maintenance
- 8 Best practices

9 Support

Page 114



1. Raise TidyPAL. Tighten the suplied screws M12 at a distance of 12mm to achieve a space to install the wheels. Use 19mm socket. (*The use of an extender is highly recommended for better work*)

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Caster wheels Asembly

2. Wheels holder installation. Tight the M8x20 screews and washers suplied using the wheels holder. Repeat this step in the 4 points previusly shown.





Caster wheels Asembly

1. Go down TidyPAL. Remove the 4 M12 supplied screews until the wheels touch the ground. Use 19mm socket. (*The use of an extender is highly recommended for better work*)





Lifting for transport

1. Lift TidyPAL. There are two lifting point. Use any type of holder like slings or ropes with M10 eyebolt.





- **1. Remove drawer.** Remove M5 screws and washers.
- 2. Loosen plate holder. Remove M5 screews and washer. Be careful with the square before loseen all screews, the spring is tauten.

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3. Remove plate. Remove M5 screews, nuts and washers. Be careful with the square of the holder due to the spring is pre-tauten. The square can rotate violently.

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Remove curtain (Top)

- 1. Remove the front cover. Remove the 2 M6 screws.
- 2. Remove the top cover. Remove the 6 M6 screws on the inside of the cover.





Remove self-retracting bellows (Upper)

- **3. Remove the plate.** Remove the 4 M5 screws and washers. Be careful when loosening the screws as the spring is pre-tensioned.
- 4. **Remove the bellows plate.** Remove the 4 M5 screws, nuts and washers. When removing the bellows, be careful with the spring tension as once removed from the bracket, the bracket will tend to rotate.





Preventive maintenance work

Each maintenance plan for each functional group of the product is detailed below.

	Work		FREQUENCY			
Component		Measures	Monthly	Quarterly	Half-yearly	Annual
Maintenance unit	Review	Check for condensation. Possibility of air leakage.	x			
General installation	Review	Checking of all sensors and cleaning	х			
General installation	Damages	Check the equipment for the following damage: Paint deterioration Bent components Cracks in components Cracks in welding		X		

Page 123

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Preventive maintenance work

Each maintenance plan for each functional group of the product is detailed below.

			FREQUENCY			
Component	Work	Measures	Monthly	Quarterly	Half-year	Annual
General installation	Loose components	Check tightening torques of bolts and nuts, according to tables on page 116.			x	
Linear guides	Review	Check for dirt and grease. Clean and grease according to manufacturer's specifications.			x	
Vacuum claw	Review	Check the condition of the equipment. In case of damage or deterioration, contact the manufacturer.			x	

Page 124

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Preventive maintenance work

Each maintenance plan for each functional group of the product is detailed below.

	Work	Measures	FREQUENCY			
Component			Monthly	Quarterly	Half-year	Annual
Roll-up bellows	Review	Check the tension of the roller shutter. If tensioning is necessary, follow the manufacturer's instructions.			x	
Components	Check the condition of components such as: • Detectors • Beacons • Light beacons • Pneumatic components	Replacement of worn, damaged or malfunctioning parts.			х	

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Preventive maintenance work

The tightening torque tables for the fasteners are attached below.

Galvanised screws

Tamaño	Par de apriete [Nm]			
de rosca	8.8	10.9	12.9	
M3	1.1	1.58	1.9	
M4	2.6	3.9	4.5	
M5	5.2	7.6	8.9	
M6	9	13.2	15.4	
M8	21.6	31.8	37.2	
M10	43	63	73	
MI2	73	108	126	
MI4	117	172	201	
MI6	180	264	309	
M20	363	517	605	
M22	495	704	824	
M24	625	890	1041	
M27	915	1304	1526	
M30	1246	1775	2077	
M36	2164	3082	3607	

Blued screws

Tamaño	Par de apriete [Nm]		
de rosca	8.8	10.9	12.9
M4	3	4.6	5.1
M5	5.9	8.6	10
M6	10.1	14.9	17.4
M8	24.6	36.1	42.2
M10	48	71	83
MI2	84	123	144
MI4	133	195	229
MI6	206	302	354
M20	415	592	692
M22	567	804	945
M24	714	1017	1190
M27	1050	1496	1750
M30	1420	2033	2380
M36	2482	3535	4136

Stainless steel screws

nutai

Tamaño	Par de apriete [Nm]			
de rosca	50	70	80	
M3	0.37	0.8	1.1	
M4	0.86	1.85	2.4	
M5	1.6	3.6	4.8	
M6	2.9	6.3	8.4	
M8	7.1	15.2	20.3	
MI0	14	30	39	
MI2	24	51	68	
MI4	38	82	109	
MI6	58	126	168	
M20	115	247	330	
M22	157	337	450	
M24	198	426	568	
M27	292	—	—	
M30	397	—	—	
M36	690	—	—	

Overview



- 1 Introduction
- 2 Requirements
- 3 Elements
- 4 Functionalities
- 5 Axis configuration
- 6 Safety
- 7 Assembly and maintenance
- 8 Best practices

9 Support

Page 127

Best practices



$\stackrel{\mathcal{P}}{\longrightarrow}$ We advise you to follow the recommendations below:

- Before starting a cycle, check that there is no risk of collision.
- Check the operation of the sensors before starting a cycle.
- The components may only be handled by qualified technical personnel.
- During a cycle, position the teach pendant in the cabinet.
- If you replace any components, perform a Home and check their functioning
- Carry out regular maintenance on your mechanical components¹
- After assembly of the equipment, <u>the vertical axis</u> and <u>the pallet points</u> must be calibrated.

¹ For more information, please visit the manufacturer's website: <u>https://www.festo.com</u>





• In the event of a protective shutdown or sudden stop of the program in progress,

check the robot load on the installation node.



 (\Box) Be sure to apply the load.

Overview



- 1 Introduction
- 2 Requirements
- 3 Elements
- 4 Functionalities
- 5 Axis configuration
- 6 Safety
- 7 Assembly and maintenance
- 8 Best practices



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Support



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