

Reference Manual

URCap CAPTRON TCP – Version 1.0.2_EN



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C/IPTRON

Contents

1 Intr	oduc	tion	4
1.1	Abo	out this document	4
1.2	Red	quirements and supported versions	4
1.3	Upo	date the URCap	4
2 Ins	tallat	ion	5
2.1	Inst	talling the URCap	5
2.2	Uni	nstall the URCap	8
3 Ins	tallat	ion Page	9
3.1	Lice	ensing	9
3.1	.1	Enter license key on robot	9
3.2	Set	up and editing CAPTRON TCP	10
3.2	.1	Setup new CAPTRON TCP	10
3.2	.2	Edit existing CAPTRON TCP	15
3.2	.3	Rename CAPTRON TCP	16
3.2	.4	Delete CAPTRON TCP	17
3.2	.5	Setup Wizard Parameters	17
3.2	.6	URCap Settings	19
3.2	.7	Calibrate CAPTRON TCP manually	20
4 Pro	ogran	n Node CAPTRON ACTION	21
4.1	Inse	ert CAPTRON ACTION	21
4.1	.1	TCP Check	22
4.1	.2	TCP Validate	23
4.1	.3	TCP Recalibrate	24
4.2	Bas	sic Settings	25
4.3	Tol	erances	26
4.4	Ass	signment	27
4.5	Erre	or Handling	28
4.5	.1	Enable Error Handling	28
4.5	.2	Disable Error Handling	29
4.6	Scr	ipt Functions	30
5 Tro	ouble	shooting	31
5.1	Erre	or Messages Installation	31
5.2	Sta	tus Messages CAPTRON ACTION	32
6 Ind	ex		
6.1	List	of Figures	33

1 Introduction

The URCap CAPTRON TCP is a software extension for the UR robot (Universal Robots). It was developed to integrate the CAPTRON TCP sensors with minimal effort. With the CAPT-RON TCP sensors, a TCP set up on the robot can be checked and adjusted during program runtime. Inaccuracies in the TCP, e.g. due to the replacement of an adhesive nozzle, can be easily corrected manually or automatically.

1.1 About this document

The reference manual contains an overview of all functions of the URCap. It was created for robot programmers, software developers and maintenance technicians.

1.2 Requirements and supported versions

E-Series robots (UR3, UR5, UR10 or UR16) from PolyScope 5.11. UR20/30 robots with PolyScope from version 5.11.

1.3 Update the URCap

Attention: Robot programs that were created with a previous version may no longer be used. The robot programs and the robot installation may have to be recreated or adapted. To install the URCap version 1.0.1 on a system where an earlier version is already installed.

- Uninstall the previous version
- Check the PolyScope version, if necessary update to a newer version (version 5.11)
- To avoid configuration conflicts, create a new robot installation
- Install the new version of the URCap

2 Installation

2.1 Installing the URCap



Fig. 1: Home screen

- 1. Start the robot
- 2. Insert the USB device with the URCap
- 3. Click the hamburger menu in the top right corner

J.			PROGRAM <unnamed> INSTALLATION default</unnamed>	New	Open 5	Save	C4FC 5F16	X
						_	? Help	
			Getting Started				Abo 4	
							Settings	
		What wou	uld vou like to d	lo fir	st?		山 Shutdown Re	obot
	RUN A PROGRAM		PROGRAM THE ROBOT			CONFIGURE RO INSTALLATIO	BOT IN	
•	Power off		Speed 100%	•			Simulation	

Fig. 2: Select Settings

4. Click "Settings"

Run Program Installation Move		PROGRAM <unnamed< b=""> INSTALLATION default</unnamed<>	> New	Open Save	C4FC 5F16
		Settings			
> Preferences	Active URCaps	1	nactive UR	Caps	
> Password		0	∋ Remote T	CP & Toolpath	
✓ System					
System Backup					
License: 5					
URCaps					
Remote Control	URCap Information				
Constrained Freedrive					
Network					
Update					
> Security					
	6				
Exit	+ -				Restart
Power off		Speed 100%	-	O	Simulation

Fig. 3: Add URCap

- 5. Click on "URCaps"
- 6. Click "+"

	PROGRAM <unnamed></unnamed> INSTALLATION default	New Open	Save	C4FC ===
	Select URCap to install			
New Cut Copy Paste Delete Rename				est 1 Badup
CAPTRON-TCP-1.0-RC2.urcep				
Filename:	Filter:			
/usb/CAPTRON-TCP-1.0-RC2.urcap	URCap Files			8 Open Cancel
Power off		•	0	
	Speed 100%			

Fig. 4: Select URCap on USB device

- 7. Select URCap on USB device
- 8. Click "Open" to install the URCap

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		Settings
> Preferences	Active URCaps	Inactive URCaps
> Password	CAPTRON TCP	😑 Remote TCP & Toolpath
V System		
System Backup		
Licenses		
URCaps		
Remote Control	URCap Information	
Constrained Freedrive		
Network		
Update		
> Security		
		The changes require a restart to take effect 9
Exit	+ -	Restar

Fig. 5: Restart the robot

9. Agree to the end user license agreement by clicking on "Restart". The robot is restarted to complete the installation

		Settings					
> F	Preferences	Active URCaps 10	Inactive URCaps				
> Password		CAPTRON TCP	😑 Remote TCP & Toolpath				
\mathbf{v}	System						
	System Backup						
	Licenses						
	URCaps						
	Remote	URCap Information					
	Control	URCap name: CAPTRON TCP Version: 1.0.0		^			
	Constrained Freedrive	Developer: CAPTRON Electronic GmbH Contact Info: Johann-GGutenberg-Str. 7, 82140 Olching, Ge	rmany				
	Network	Description: URCap to use the CAPTRON TCP measurement units Copyright: Copyright (c) 2024 CAPTRON Electronic GmbH					
	Update	License Type: See license agreement below License:					
> 5	Security	End-User License Agreement (EULA)					
		1. Introduction This End-User License Agreement ("EULA") is a legally binding GmbH Johann-G -Gutenberg-Str. 7. 82140 Olching Germany (contract between the user ("Licensee") and CAPTRON Electronic "CAPTRON") renarding the use of the software ("Software") for	~			
	Exit	+ -	Re	start			

Fig. 6: URCap successfully installed

10. If the URCap has been successfully installed there is a green check mark next to the URCap name

2.2 Uninstall the URCap



Fig. 7: Remove the URCap

- 1. Select the URCap to be uninstalled
- 2. Click "-"
- 3. Restart the robot

3 Installation Page

3.1 Licensing

In order to use the URCap, a valid license key must be purchased in advance. The license key must be entered and saved on the installation page. The license is a one-time purchase.

3.1.1 Enter license key on robot

The license key is generated using the robot ID displayed on the robot. To do this, open the installation page and follow steps 1-7.

		PROGRAM <unnamed></unnamed> INSTALLATION default*	New Ope	en Seve	C4FC 5F16
🔪 General	CAPTRON TCP				
 > Safety > Features 	Overview				<i>C/IPTRO</i> Γ
Fic 2 us URCaps 3 CAPTRON TCP	Select TCP	Rename			
	TCP Correction X 0.00 mm RX 0.0 ° Y 0.00 mm RY 0.0 ° Z 0.00 mm RZ 0.0 ° Ø 0.00 mm RZ 0.0 ° Calibrate Image: Calibrate Image: Calibrate	Stop			
					4 Update License
Power off		Speed 100%	•	D	

Fig. 8: Installation page

- 1. Open the installation page
- 2. Go to URCaps
- 3. Click on "CAPTRON TCP"
- 4. Click on "Update License"



Fig. 9: Robot ID

5. Use the displayed robot ID to generate your software license key on https://www.captron.com/ur/.





Fig. 10: Enter license key

6. Enter your software license key in the input field instead of the message for the robot ID



Fig. 11: Valid license

7. You will recognize a successful activation by the green symbol

3.2 Setup and editing CAPTRON TCP

Up to 10 TCPs can be managed in a robot installation. The setup is done with the help of a setup wizard. To successfully set up a CAPTRON TCP, at least one configured TCP must be available, which can be used as a reference TCP.

3.2.1 Setup new CAPTRON TCP

		PROGRAM <unnamed></unnamed> INSTALLATION default*	New Open Save	C4FC =
🔪 General	CAPTRON TCP			
> Safety > Features	Overview	•	СЛІ	PTRON
Fieldbus URCaps	Select TCP	Setup Rename		
CAPTRON TCP	+ - Settings TCP Correction X 0.00 mm RX Y 0.00 mm RZ 0.00 mm RZ Ø 0.00 mm RZ 0.00 mm RZ Ø Calibrate Image: Comparison of the set of the s	(NOT CAUBRATED) 0.0 ° 0.0 °		
				• Update License
Power off		Speed 100%		Simulation

Fig. 12: Open setup wizard

- 1. Open the installation page
- 2. Click "+" (a new TCP will be created)
- 3. Click "Setup" to open the setup wizard



Fig. 13: Setup wizard step 1

- 4. Select the TCP variant used
- 5. Click on "Next"

		PROGRAM <unnamed> INSTALLATION default* Her Open. Swr SF16</unnamed>
> General	CAPTRON TCP	
> Safety	Setup Wizard	Stop (2/2) - Soloct 10's
> Features		Select input X 6 Select input Y 7
> Fieldbus	✓ Select TCP variant	<select input=""></select>
✔ URCaps		<select input=""></select>
CAPTRON TCP	Select IO's	
	Select reference TCP Teach center pose Parameter	digital_in(2) digital_in(3) digital_in(5) cone cone digital_in(6) cone digital_in(7) cone digital_in(7) cone config_in(0) cone config_in(1) cone
		config_in[2] config_in[3] config_in[4] config_in[5]
	Setup complete	config_in[7] xt Cancel
Run Program Instalation		PROGRAM <unnamed> L En C4FC C C4FC SF16</unnamed>
> Safety		
 Features Fieldbus URCaps 	Setup Wizard	Step (2/7) - Select IO's Select input X K_IS_X Select input Y K_IS_y
CAPTRON TCP	✓ Select IO's	
	Select reference TCP	
	Teach center pose	
	Parameter	
	Referencing	
	Setup complete	Previous Next Cancel
Power off		Speed 100%

Fig. 14: Setup wizard step 2

- 6. Select input X-axis (white cable of the CAPTRON TCP sensor)
- 7. Select input Y-axis (black cable of the CAPTRON TCP sensor)
- 8. Click on "Next"

Note: Both digital and configurable inputs can be used. To identify the input used for the sensor, you can rename the IO in the robot's IO setup.

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		PROGRAM <umraned> 🔓 🚔 🖬 C4FC 🗮</umraned>
> General	CAPTRON TCP	
> Safety	Setup Wizard	Stop (2/7) - Solast 9 rongs TCD
> Features	botap trizara	
> Fieldbus	✓ Select TCP variant	<select tcp=""></select>
CAPTRON TCP	✓ Select IO's	
	Select reference TCP	1 Jan 6
	Teach center pose	
	Parameter	V
		×.
	Setup complete	Previous Next Cancel
Power off		Speed 100%

Fig. 15: Setup wizard step 3

- 9. Select reference TCP
- 10. Click on "Next"





Fig. 16: Setup wizard step 4

- 11. Click on Set Center to teach the center position (The center position must be taught so that both light barriers are interrup-ted and both LEDs light up)
- 12. Click on "Next"

General	CAPTRON TCP				
Safety	Setup Wizard		Step (5/	7) - Parameter	
Features		Motion radius		Search Z	
Fieldbus	🗸 Select TCP variant	15.0	mm	20.0	mm
URCaps		Speed		Acceleration	
CAPTRON	Select IO's	50.0	mm/s	100.0	mm/s²
TCF	Q 000001000	Motion overrun (36	50+n)	Adjust angle	
		15.0	•	🔘 Don't adjust angle	
	Select reference TCP			🔿 Adjust angle active	
				Iterator	
	🗸 Teach center pose			1	
				Offset Z	
	/ Paramotor			5.0	mm
				Accuracy	
				0.5	0
	Referencing				
			13		
	Setup complete			-	
		🗬 Previous	Next 🗭		Cancel

Fig. 17: Setup wizard step 5

13. Click on "Next"

(If problems occur during referencing/calibration, the parameters might need to be adjusted, explanations in chapter 3.2.5 Setup wizard settings)

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		PROGRAM <unnamed>* 📴 📑 🖬 III IIII CAFC == C4FC == 5F16</unnamed>
> General	CAPTRON TCP	
> Safety	Setup Wizard	Ston /6 👝 Deferencing
> Features		
> Fieldbus	✓ Select TCP variant	Start Referencing Stop
V URCaps		
CAPTRON TCP	✓ Select IO's	
VNC Server		0
Remote TCP & Toolpath	✓ Select reference TCP	
	✓ Teach center pose	
	✓ Parameter	
	✓ Referencing	Collination successful
	Setup complete	Cancel
N ormal		Speed 100%

Fig. 18: Setup wizard step 6

- 14. Click on "Referencing" to start referencing (The robot then carries out its reference movement. This determines the intersection point of the two light barriers for the offset calculation)
- 15. Click on "Next" (If an error occurs during referencing, please check the parameter in the previous step)



Fig. 19: Setup wizard step 7

16. Click "Finish" to complete the setup process

3.2.2 Edit existing CAPTRON TCP

In order to adjust basic settings such as the movement radius or similar after the initial setup, the setup wizard can be repeated at any time.

		PROGRAM <unnamed>*</unnamed> INSTALLATION default_1*	New Open	Save	
> General	CAPTRON TCP				
> Safety	Overview				CAPTRON
> Features		6			C/II- TROM
> Fieldbus	Select TCP				
VURCaps 1	CAPIRON ICP #1	Setup Rename			
CAPTRON	+ - Settings				
VNC Server	TCP Correction	CALIBRATED		E	-
Bemote TCP	X 0.00 mm RX -	0.0 °		- Con	and and
& Toolpath	Z -0.10 mm RZ -	0.0 °			
	Ø 1.61 mm		*		
	Calibrate	Stop			
					Update License
	-				
		Speed 100	0%		

Fig. 20: Open Setup Wizard for editing

- 1. Open the installation page and click on "CAPTRON TCP"
- 2. Select the desired CAPTRON TCP from the selection
- 3. Click on "Setup" to open the setup wizard
- 4. Repeat steps 4-16 from the previous chapter (Setup new CAPTRON TCP)

3.2.3 Rename CAPTRON TCP



Fig. 21: Rename CAPTRON TCP

- 1. Open the installation page and click on "CAPTRON TCP"
- 2. Select the desired CAPTRON TCP from the selection
- 3. Click on "Rename" to open the input dialog



Fig. 22: Enter name for CAPTRON TCP

- 4. Enter the desired name in the input field
- 5. Click "OK" to confirm the change



		PROGRAM <unnamed></unnamed> INSTALLATION default*	New Oper Save	C4FC ≡
🔪 General	CAPTRON TCP			
> Safety	Overview		СЛР	TROD
Features			C/II	mon
> Fieldbus	Select TCP			
VURCaps 1	Captron 3 #1	Setup Rename		
CAPTRON	+ I Settings			
TCP	TCP Correction	Confirmation		
	X 0.00 mm RX Y 0.00 mm RY Z 0.00 mm RZ Ø 0.00 mm C Calibrate	The selected TCP will be deleted. Do you want to continue? Captron TCP #1 Yes No		
				Update License
Normal		Speed 100%		Simulation

Fig. 23: Delete CAPTRON TCP

- 1. Open the installation page and click on "CAPTRON TCP"
- 2. Select the desired CAPTRON TCP from the selection
- 3. Click "-"
- 4. Click "Yes" to confirm deletion

3.2.5 Setup Wizard Parameters

The preset values are specific to the respective TCP sensor and may need to be adjusted, as tools can differ greatly.

		PROGRAM	I <unnamed></unnamed>	рани и сорел Среп	C4FC Ⅲ 5F16 Ⅲ
📏 General	CAPTRON TCP				
> Safety	Setup Wizard		Sten (5/	7) - Parameter	
> Features		Motion radius	Step (5/	Search Z 4	
> Fieldbus	✓ Select TCP variant	15.0	mm	20.0	mm
V URCaps		Speed	2	Acceleration	5
CAPTRON TCP	✓ Select IO's	50.0	1 mm/s	100.0	mm/s²
		Motion overru 3 60+i	n)	Adjust angle	, i i i i i i i i i i i i i i i i i i i
	✓ Select reference TCP	15.0			
				Iterator	8
	✓ Teach center pose			1	Y
				Offset Z	9
	✓ Parameter			5.0	▼mm
				Accuracy	0
	Referencing			0.5	
	Setup complete				
		Previous 🗧	Next 🗭		Cancel
Normal		Sp	eed 100%		

Fig. 24: Setup Wizard Parameters

1. Under "Motion radius", the radius for the reference/calibration movement can be set

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- Under "Speed", the speed of the reference/calibration movement can be set. The speed set here serves as the basis for the CAPTRON ACTION used in the program
- 3. Under "Motion overrun (360+n)" you can set a number of degrees by which the complete circular movement for the reference/calibration movement is exceeded. This value must be adjusted if the reference/calibration movement ends exactly within a light barrier
- 4. Under "Search Z" you can set the Z-stroke that is used to determine the Zlength of the TCP
- 5. Under "Acceleration", the acceleration of the reference/calibration movement can be set. The acceleration set here serves as the basis for the CAPTRON ACTION used in the program
- 6. If "Do not adjust angle" is selected, no angle correction is performed
- 7. If "Adjust angle" is active, the angle correction is carried out
- 8. Under "Iterator" you can set how often the angle search is repeated to achieve the desired accuracy
- Under "Offset Z", the Z-stroke used for the angle search can be set. The TCP therefore immerses into the CAPTRON TCP sensor by the set value at the intersection point of the light barriers in order to determine the tilting of the TCP
- 10. Under "Accuracy", you can enter a desired number of degrees for the angle correction. If the determined correction value is smaller than the input value, the angle search is terminated even if the iterator value is not reached

3.2.6 URCap Settings

		PROGRAM <unnamed>*</unnamed> INSTALLATION default_1*	New Open Si		C4FC ≡
> General	CAPTRON TCP				
Safety Features	Overview			СЛРТ	RON
> Fieldbus	Select TCP				
VURCaps 1	CAPTRON TCP #1 2	 Setup Rename 			
CAPTRON	+ - Settings				
VNC Server	X 0.00 mm RX	-0.0 °		R. C.	
Remote TCP & Toolpath	Y -0.10 mm RY	-0.0 °		· carmon	
	Ø 1.61 mm	-0.0			
	Calibrate	Stop			
				• یا	Ipdate License
Normal				🕨 🖸 🖸 Simu	lation
		Speed 100	»%		
Run Program Installation		PROGRAM <unnamed>* INSTALLATION default_1*</unnamed>	New Open Si		5F16 =
> General	CAPTRON TCP				
> Safety	< Overview Se	ttings		СЛРТ	RON
> Features	Error Handling	3			
V URCaps	Automatically open dialo	gs and warnings 4			
CAPTRON	O Error handling is user re	sponsibility (check for action status)		
VNC Server	Debug Level 5				
Remote TCP	No outputs on log scree				
& I oolpath	Verbose outputs on log	screen			
	U				
<u> </u>			-		
Normal		Speed 100)%		lation

Fig. 25: URCap Settings

- 1. Open the installation page and click on CAPTRON TCP
- 2. Click on "Settings"
- 3. If this setting is active, process errors will be displayed via pop-ups
- 4. If this setting is active, process errors are not displayed
- 5. If this setting is active, no log entries are displayed on the log screen
- 6. If this setting is active, only important information and error messages are displayed on the log screen
- 7. If this setting is active, all messages are displayed on the log screen

3.2.7 Calibrate CAPTRON TCP manually

		PROGRAM <unnamed>* INSTALLATION default_1*</unnamed>	New Open Save	
> General	CAPTRON TCP			
> Safety	Overview			СЛРТВОЛ
> Features				c/ii /iiio/i
> Fieldbus	CAPTRON TCP #1	 Setup Rename 		
VURCaps 1	+ - Settings			
		CAUBBATED		
VNC Server	X 0.00 mm RX	0.0 °		5 AUS
Remote TCP & Toolpath	Y -0.20 mm RY	-0.0 °		- Chermon
	Ø 3.55 mm			
	Calibrate	4 Stop		
	culbrate	k		
				Update License
Normal		Generation Speed 100)%	D D Simulation
				A
		PROGRAM <unnamed>* INSTALLATION default_1*</unnamed>	New Open Save	
Run Program Instalation		PROGRAM <unnamed>* INSTALLATION default_1*</unnamed>	New., Open., Save.,	
Run Program Installation > General > Safety	CAPTRON TCP Overview	PROGRAM «unnamed»* INSTALLATION default_1*	New Open Save	
Run Program Installation > General > > Safety > Features	CAPTRON TCP Overview Select TCP	PROGRAM <urnamed>* INSTALLATION defaut_1*</urnamed>	Li L	
Run Program Instalator > General > Safety > Features > Fieldbus > Fieldbus >	CAPTRON TCP Overview Select TCP CAPTRON TCP #1	PROGRAM <urnamed>* INSTALLATION default_1* Setup Rename</urnamed>	Nen. Open. Save.	
VI Elevent Labor Concernal Conc	CAPTRON TCP Overview Select TCP CAPTRON TCP #1	PROGRAM <urnamed>* INSTALLATION default_1* Setup Rename</urnamed>	La Dort. Save.	
Very Program Installator > General > Safety > Features > Fieldbus > VIRCaps CAPTRON TCP TCP	CAPTRON TCP Overview Select TCP CAPTRON TCP #1 + - Settings TCP Correction	PROGRAM <urnamed>* INSTALLATION default_1* Setup Rename (CALIBRATED)</urnamed>	La En En	
Vic Server	CAPTRON TCP Overview Select TCP CAPTRON TCP #1 + • Settings TCP Correction X 0.00 mm RX	PROGRAM <urnamed>* INSTALLATION default_1* Setup Rename CALIBRATED -0.0 °</urnamed>	La por care.	
Very Proy Prod > General > > Safety > Features > Fieldbus VURCSps CAPTRON TCP VNC Server Remote TCP & Toolpath	CAPTRON TCP Log Overview Select TCP CAPTRON TCP #1 • • • • • Settings • TCP Correction X X 0.00 mm RX Y •0.10 mm RZ		Ven. Open. Save.	
Very metadation > Ceneral > Safety > Features > Fieldbus VURCServer Remote TCP & Toolpath	CAPTRON TCP Log Overview Select TCP CAPTRON TCP #1 • • • • • Settings • TCP Correction X X 0.00 mm RX Y •0.10 mm RZ Ø 1.61 mm •	Setup Rename CALIBRATEO -0.0 * -0.0 * .0.0 *	Ven. Opp. Seet.	
Very metadation Very metadation Very metadation Safety Features Features Very metadation	CAPTRON TCP CAPTRON TCP OVERVIEW Select TCP CAPTRON TCP #1 + Settings TCP Correction X 0.00 mm RX Y -0.10 mm RY Z -0.10 mm RZ Ø 1.61 mm Celibrate	PROGRAM <urnamed>* INSTALLATION default_1* ▼ Setup Rename -0.0 ° -0.0 ° -0.0 ° Stop</urnamed>	Ven. Open. Seen.	
Very metadation Very metadation Very metadation Safety Features Features Very metadation	CAPTRON TCP CAPTRON TCP OVERVIEW Select TCP CAPTRON TCP #1 + Settings TCP Correction X 0.00 mm RX Y -0.10 mm RY Z -0.10 mm RZ Ø 1.61 mm Calibrate	PROGRAM cumamed>* INSTALLATION default_1* Setup Rename -0.0 ° CALBRATEO -0.0 ° Q -0.0 ° Q Stop Stop	Ven. Open. Seen.	
Vice and the second sec	CAPTRON TCP CAPTRON TCP OVERVIEW Select TCP CAPTRON TCP #1 + Settings TCP Correction X 0.00 mm RX Y -0.10 mm RY Z -0.10 mm RZ Ø 1.61 mm Calibrate	PROGRAM curnamed>* INSTALLATION default_1* Setup Rename -0.0 ° CALBRATEO -0.0 ° Q -0.0 ° Q Stop Stop	Ven. Open. Seen.	
Very metadation Very metadation Very metadation Safety Features Features Very metadation	CAPTRON TCP CAPTRON TCP OVERVIEW Select TCP CAPTRON TCP #1 CAPTRON TCP #1 CAPTRON TCP #1 CAPTRON TCP #1 CAPTRON TCP #1 CAPTRON TCP #1 CAPTRON TCP CAPTRON TCP CAPT	PROGRAM cumamed>* INSTALLATION default_1* Setup Rename -0.0 ° CALBRATEO -0.0 ° Q -0.0 ° Q Stop Stop	Ven. Open. Seen.	
Very metadation > Conserval > Safety > Features > Fletdbus > URCaps CAPTRON TCP VNC Server Remote TCP & Toolpath	CAPTRON TCP CAPTRON TCP OVERVIEW Select TCP CAPTRON TCP #1 CAPTRON TCP #1 Settings TCP Correction X 0.00 mm RX Y -0.10 mm RY Z -0.10 mm RZ Ø 1.61 mm Calibrate	Setup Rename -0.0 ° • -0.0 ° • Stop Stop	Ver. Oper. Ser.	
Very metadation > Concral > Safety > Features > Fieldbus > URCaps CAPTRON TCP VNC Server Remote TCP & Toolpath	CAPTRON TCP CAPTRON TCP OVERVIEW Select TCP CAPTRON TCP #1 CAPTRON TCP #1 Settings TCP Correction X 0.00 mm RX Y 0.10 mm RY Z 0.10 mm RZ Ø 1.61 mm Calibrate	PROGRAM <urnamed>* INSTALLATION default_1* Setup Rename -0.0 ° Q -0.0 ° Q Stop Stop</urnamed>	Ver. Opr. Ser.	
Vice Vice Vice Vice Vice Vice Vice Vice	CAPTRON TCP OVERVIEW Select TCP CAPTRON TCP #1 • • • Settings TCP Correction X 0.00 mm RX Y 0.10 mm RY Z 0.10 mm RZ Ø 1.61 mm Calibrate		Ver. Oper. Constant	
Vice Program (Control of the second s	CAPTRON TCP Overview Select TCP CAPTRON TCP #1 + Settings TCP Correction X 0.00 mm RX Y 0.10 mm RY Z 0.10 mm RZ Ø 1.61 mm Calibrate		Ven. Open. E.	

Fig. 26: Calibrate CAPTRON TCP manually

- 1. Open the installation page and click on CAPTRON TCP
- 2. Select the desired CAPTRON TCP from the selection
- 3. Click "Calibrate" to start calibration
- 4. The progress bar is displayed while the calibration is running
- 5. Click "Stop" to interrupt/end the calibration prematurely
- 6. The status is displayed in the lower part of the screen after calibration has been completed
- 7. The correction values in relation to the reference TCP are displayed here. Use the corresponding TCP "CAPTRON TCP #No." in the program

Note: After setup, no additional manual calibration is required to use the CAPTRON TCP in the program sequence

4 Program Node CAPTRON ACTION

With the CAPTRON ACTION, all available functions can be used. The TCP can be checked, validated or recalibrated.

4.1 Insert CAPTRON ACTION

		GRAM <unnamed>* ATION default_1*</unnamed>	New Oper		
> Basic	Q	Command	Graphics	Variables	
 Advanced Templates URCaps CAPTRON ACTION Toolpath Move 	1 X: Variables Sotup 2 Robot Pro 2 m 3 ♥ CAPTRONAction 4 ♥ ♥ If Error 5 ♥ "Insert your error handling her	CAPTRON Select TCP	ACTION	Action 4 CP Check CP Validate CP Recalibrate	
Remote TCP Move	ŀ	Basic Settings	Tolerances	Assignment	
		Set speed		Adjust angle	
		Normal	-	🔘 Don't adjust angle	
		Set approach 2	:	O Adjust angle active	
		50.0	mm	Set accuracy iterato	or
		Set immerse Z		1	
		0.0	mm	Set offset Z	
		Set TCP after	recalibrate	0.0	mm
	< 、 、 、 、 、 、				<i>C/</i> IPTRON
Normal		Speed 10	9%	00	Simulation

Fig. 27: Insert CAPTRON ACTION

- 1. Insert CAPTRON ACTION to the program tree by clicking on CAPTRON ACTION
- 2. Activate the Program Node
- 3. Select the desired CAPTRON TCP from the selection
- 4. Select the action to be performed

4.1.1 TCP Check

During TCP Check, the robot moves with the selected CAPTRON TCP to the intersection point of the CAPTRON TCP sensor. For the check to be successful, both light barriers must be interrupted. If this is not the case, an immersion movement is carried out (immersion parameter *Z*) to check for minimal wear. If the light barriers still do not respond after immersion, the check has failed and error handling is called, otherwise the program flow continues.

		PROGI INSTALLAT	RAM <unnamed>*</unnamed> NON default_1*	New Open	Save	C4FC =
> Basic		Q	Command	Graphics	Variables	
> Advanced> Templates	1 X Variables Sotup 2 ▼ Robot Pro ² am		CAPTRON	ACTION	-	
URCaps CAPTRON ACTION	3 • TCP Check (1) 4 • • 5 • •	ling here	Select TCP	3 ↓ ▼	Action 4 TCP Check	
Toolpath Move					O TCP Validate O TCP Recalibrate	
Move			Basic Settings	Tolerances	Assignment	
			Set speed		Adjust angle	
			Normal	•	🔘 Don't adjust angle	
			Set approach Z		🔘 Adjust angle active	e
			50.0	mm	Set accuracy itera	tor
			Set immerse Z	5	1	
			0.5	• mm	Set offset Z	
			Set TCP after	recalibrate	5.0	mm
	、 全手 う ぐ 米 単 直 1	> 1	Error h	andling enabled		<i>C/IPTRO</i> Π
O Normal			Speed 100)%		Simulation

Fig. 28: CAPTRON ACTION TCP Check

- 1. Insert CAPTRON ACTION to the program tree by clicking on CAPTRON ACTION
- 2. Activate the Program Node
- 3. Select the desired CAPTRON TCP from the selection
- 4. Select "TCP Check"
- 5. If necessary, adjust "Set immerse Z"



4.1.2 TCP Validate

During TCP validation, the robot performs the calibration movement of the CAPTRON TCP sensor. However, the TCP is not corrected, but merely validated to ensure that the deviation is not outside the set tolerance values. If successful, the program continues, otherwise error handling is called.

		RAM <unnamed>* TION default_1*</unnamed>	New Open] ^{C4FC} ≡
> Basic	۹	Command	Graphics	Variables	
 > Advanced > Templates 	1 X Variables Satup 2 ▼ Robot Prc ² m	CAPTRON	ACTION		
VIRCaps CAPTRON ACTION	3 ♦ ▼ TCP Validate: (1) 4 ♦ ♥ If Error 5 ● 'Insert your error handling here	Select TCP	3		
Toolpath Move				TCP Validate	
Move		Basic Settings	Tolerances	Assignment	
4		Set speed		Adjust angle	
		Normal	-	🔘 Don't adjust angle	
		Set approach Z		O Adjust angle active	
		50.0	mm	Set accuracy iterator	
		Set immerse Z		1	
		0.5	mm	Set offset Z	
		Set TCP after i	recalibrate	5.0	mm
	< ▲ ◆ つ ぐ ※ ■ 首 面 ■	Error ha	andling enabled		<i>C/IPTRO</i> Γ
Normal		Speed 100)%	D D Sir	mulation

Fig. 29: CAPTRON ACTION TCP Validate

- 1. Insert CAPTRON ACTION to the program tree by clicking on CAPTRON ACTION
- 2. Activate the Program Node
- 3. Select the desired CAPTRON TCP from the selection
- 4. Select "TCP Validate"

4.1.3 TCP Recalibrate

During TCP recalibration, the selected CAPTRON TCP is calibrated with the calibration movement of the CAPTRON TCP sensor, taking into account the set tolerances. The determined TCP correction value is assigned to the program node variable, but a user-defined position variable can also be used alternatively. If successful, the program run is continued, otherwise error handling is called.

		logf Llat	RAM <unnamed>* NON default_1*</unnamed>	New	Open	Save	R+	Local	C4FC 5F16	≡
> Basic	O	٤	Command	Grapi	nics	Variables				
Advanced Templates URCaps CAPTRON ACTION Toolpath More	1 X Variables S-tup 2 ▼ Robot Pro2 um 3 ♥ ▼ 1 ▼ ▼ 1 Fron 5 ↓	ere	CAPTRON Select TCP CAPTRON TCP #J		ON T		leck .date			
Remote TCP Move			Basic Settings	Toler	ances	Assignment Adjust and	calibrate			
		- OF	Normal	•]	🔘 Don't a	idjust angle	e		
			Set approach Z		_	O Adjust	angle activ	/e		
			50.0		mm	Set acc	curacy iter	ator		
			Set immerse Z		1	1				
			0.5		mm	Set off	set Z			
	، • € • • • € × ∎ ⊡ ■	>	Set TCP after i	recalibra andling e	te mabled	5.0		CI	nm TPTR	юл
Normal			Speed 100)%	•	DC		Simu	lation 🤇	

Fig. 30: CAPTRON ACTION TCP Recalibrate

- 1. Insert CAPTRON ACTION to the program tree by clicking on CAPTRON ACTION
- 2. Activate the Program Node
- 3. Select the desired CAPTRON TCP from the selection
- 4. Select "TCP Recalibrate"

4.2 Basic Settings



Fig. 31: CAPTRON ACTION Basic Settings

- 1. Under "Speed", the robot speed for the selected action can be changed. You can choose between Normal, Fast and Slow. The base speed for this is set in the setup wizard
- 2. Under "Approach Z", the Z offset used for the movement to the CAPTRON TCP sensor can be set
- 3. Under "Set immerse Z", the Z offset used in the "TCP Check" and "TCP Validate" actions to immerse into the CAPTRON TCP Sensors in the intersection point of the light barriers can be set
- 4. Checkbox to activate the TCP correction value automatically on successful recalibration
- If "Do not adjust angle" is selected, the angle deviation is not checked in the "TCP Validate" action and is neither checked nor corrected in "TCP Re-calibrate"
- 6. If "Adjust angle" is active, the angle deviation is checked in the "TCP Validate" action and is checked and corrected in "TCP Recalibrate"
- 7. Under "Accuracy iterator", the accuracy of the angle correction can be increased if necessary. To achieve this, the angle search is repeated until the entered value is reached or until the accuracy from the setup wizard is achieved
- 8. Under "Offset Z", the Z stroke used for the angle search can be set. The TCP therefore immerses into the CAPTRON TCP sensor by the set value at the intersection point of the light barriers in order to determine the tilting of the TCP
- 9. Error handling can be activated or deactivated using the slider

4.3 Tolerances



Fig. 32: CAPTRON ACTION Tolerances

- 1. Under "Min", the minimum deviation tolerance for the "TCP Validate" and TCP Recalibrate actions can be set (XYZ offset and diameter). The deviation determined must therefore not be less than this value
- 2. Under Previous, the most recently determined deviation is displayed. For this, the robot program must have run through the CAPTRON ACTION at least once
- Under Max, the maximum deviation tolerance for the "TCP Validate" and "TCP Recalibration" actions can be set (XYZ offset and diameter). The deviation determined must therefore not exceed this value
- 4. Under Previous, the most recently determined value of the angle correction is displayed. For this, the angle adjustment must be active and the robot program must have run through the CAPTRON ACTION at least once
- Under "Max", the maximum correction value for the angle adjustment can be set (RX and RY). The angle determined must therefore not exceed this value

4.4 Assignment



Fig. 33: CAPTRON ACTION Assignment

- 1. If "Use default recalibration variable" is active, the determined TCP correction value, which is determined during TCP recalibration, is assigned to this variable
- 2. If "Use custom TCP variable" is active, the determined TCP correction value, which is determined during TCP recalibration, is assigned to the selected position variable
- 3. The "Move Start" button can be used to move the robot to the start position in the CAPTRON TCP sensor. The start position depends on the selected action. With "TCP Check" and "TCP Validate", the intersection point with the currently calibrated correction value is approached. With "TCP Recalibration", the center position from the setup wizard is approached with the reference TCP
- 4. The "Move Approach" button can be used to move the robot to the start position including the set approach Z value in the CAPTRON TCP sensor

4.5 Error Handling

Error handling is enabled by default, so that the logic to be executed in the event of an error must be programmed in the "If Error" program node in the program tree.

4.5.1 Enable Error Handling



Fig. 34: CAPTRON ACTION Enable Error Handling

- 1. Activate the Program Node
- 2. Activate error handling
- 3. Program the logic for error handling at this point in the program tree
- 4. If the "error handling" selection is active, error handling is called immedia-tely after the error occurs
- 5. If the "Try again x times..." is selected, error handling is only called if the CAPTRON ACTION is still faulty after the entered number of repetitions



4.5.2 Disable Error Handling

If error handling is disabled, after executing the CAPTRON ACTION, the script function cap_isActionOk() must be used to check whether the check, validation or recalibration was successful.

		PROG INSTALLA	RAM <unnamed>* TION default_1*</unnamed>	New Open] ^{C4FC} ≡
> Basic		Q	Command	Graphics	Variables	
Advanced Loop	1 X Variables Setup 2 ▼ BeforeStart		CAPTRON	ACTION		
SubProg	3 select arguments and a selection of the selection of th		Select TCP		Action	
Assignment	5 • TCP Recalibrate: (1)		CAPTRON TCP #3	L 🔻	O TCP Check	
If	6 No error handling				O TCP Validate	
Script	7 🛛 🔿 Halt				TCP Recalibrate	
Event			Basic Setlings	Tolerances	Assignment	
Thread			Set speed		Adjust angle	
Switch	0		Normal	•	🔘 Don't adjust angle	
Timer			Set approach Z		O Adjust angle active	
Home			50.0	mm	Set accuracy iterator	
> Templates			Set immerse Z		1	
> URCaps			0.5	mm	Set offset Z	
					5.0	mm
			Error h	andling disabled		<i>CAPTRON</i>
	↑ ↓ う ぐ × Ⅲ 🗄	İ				
Normal			Speed 100)%	D D D si	mulation

Fig. 35: CAPTRON ACTION Disable Error Handling

- 1. Activate the Program Node
- **2.** Disable Error Handling

4.6 Script Functions

In addition to the CAPTRON ACTION, various script functions are available. Among other things, there is a function to query the status of the CAPTRON ACTION when error handling is deactivated. In addition, the correction value can be called up, for example, or the determined TCP can be set.

d2r(<deg>)</deg>											
r2d(<rad>)</rad>											
read_port_bit(<address>)</address>								0			
read_port_register(<address>)</address>	_	False (LO)		Esc		← Backspace		ace			
CAPTRON TCP - CAPTRON Electronic GmbH											1
cap_isActionOk(<tcp_id>)</tcp_id>	pr.		×	or	n	ot		7	8	9	-
cap_getStatus(<tcp_id>)</tcp_id>	1										
cap_getStatusMsg(<tcp_id>)</tcp_id>)	<	>	1	*		4	5	6	
cap_getCorrectionMM(<tcp_id>)</tcp_id>											
cap_getDiameterMM(<tcp_id>)</tcp_id>		1	-					1	2	3	
cap_activateTCP(<tcp_id>)</tcp_id>			-	_	'			-	-		Submi
cap_setTCP(<var>)</var>	~										
<function></function>					•			· ·	0	•	

Fig. 36: Script Functions

1. List of available script functions

Script Function	Description	Passing parameter	Return Value
cap_isActionOk()	Query whether the last CAPTRON ACTION exe- cution was successful	<tcp_id> = CAPT- RON TCP 1-10</tcp_id>	True False
cap_getStatus()	Status query of the last CAPTRON ACTION exe- cution	<tcp_id> = CAPT- RON TCP 1-10</tcp_id>	No. of status message, 0 = OK
cap_getStatusMsg()	Status message of the last CAPTRON ACTION execution	<tcp_id> = CAPT- RON TCP 1-10</tcp_id>	Status mes- sage
cap_getCorrec- tionMM()	Correction value of the last CAPTRON ACTION execution	<tcp_id> = CAPT- RON TCP 1-10</tcp_id>	Position vari- able with cor- rection values
cap_getDiameterMM()	Diameter of the last CAP- TRON ACTION execut- ion	<tcp_id> = CAPT- RON TCP 1-10</tcp_id>	Diameter va- lue
cap_activateTCP()	Activate recalibrated TCP (CAPTRON ACTION)	<tcp_id> = CAPT- RON TCP 1-10</tcp_id>	No return va- lue
cap_setTCP()	Set TCP offset with vari- able	<var> = Position va- riable with TCP va- lues</var>	No return va- lue

5 Troubleshooting

5.1 Error Messages Installation

No.	Description	Sugge	Suggested solution	
1	At least one input sensor is low.	-	Check the electrical wiring	
		-	Check the center point position,	
			both light barriers must be inter-	
			rupted	
2	Wrong number of interrupt points.	-	Check the electrical wiring	
	0 1 1	-	Check the calibration movement.	
			both light barriers must be inter-	
			rupted exactly 2 times. If neces-	
			sarv, correct the center point po-	
			sition or adjust the motion overrun	
			parameter	
		-	Increase the speed if necessary	
3	Unable to calculate diameter.	-	Repeat the process	
		-	If necessary, use a different angle	
			for the center point position	
4	Unable to calculate center points.	-	Repeat the process	
		-	If necessary, use a different angle	
			for the center point position	
5	Unable to calculate intersect point.	-	Repeat the process	
		-	If necessary, use a different angle	
			for the center point position	
6	Failed to convert intersect position.	-	Repeat the process	
	•	-	If necessary, use a different angle	
			for the center point position	
7	Failed to move to intersect position.	-	Check that the robot is enabled to	
			move	
8	Input low on intersect position.	-	Check the electrical wiring	
		-	If necessary, use a different angle	
			for the center point position	
9	Search motion Z failed, input not low.	-	Check the electrical wiring	
		-	Adjust the center point position so	
			that the TCP only immerses	
			about 1-2 mm into the light bar-	
			riers	
		-	Increase the Z Search parameter	
10	Unable to calculate correction/ tcp.	-	Repeat the process	
		-	If necessary, use a different angle	
			for the center point position	
11	Adjust angle, wrong number of interrupt	-	Check the electrical wiring	
	points.	-	Check the calibration movement,	
			both light barriers must be inter-	
			rupted exactly 2 times. If neces-	
			sary, correct the center point po-	
			sition or adjust the motion overrun	
			parameter	
12	Adjust angle, Unable to calculate inter-	-	Repeat the process	
	sect point.	-	If necessary, use a different angle	
			for the center point position	
13	Adjust angle, angle correction to large.	-	Reduce the tilting of the TCP	

5.2 Status Messages CAPTRON ACTION

No.	Description	Suggested solution	
0	Success		
1	Wrong number of interrupt points	 Check the electrical wiring Check if the CAPTRON TCP is correctly set up and calibrated 	
2	Unable to calculate intersect point	 Repeat the process Check if the CAPTRON TCP is correctly set up and calibrated 	
3	Invalid intersect point	 Repeat the process Check if the CAPTRON TCP is correctly set up and calibrated 	
4	Input low on intersect position	 Check if the TCP is correct Check the electrical wiring 	
5	Search motion Z failed, input not low	 Check if the TCP is correct Check the electrical wiring Check if the CAPTRON TCP is correctly set up and calibrated 	
6	TCP correction outside tolerance	 Check if the TCP is correct Adjust the tolerances accordingly 	
7	TCP diameter outside tolerance	 Check if the TCP is correct Adjust the tolerances accordingly 	
11	Wrong number of interrupt points (adjust angle)	 Repeat the process Check if the CAPTRON TCP is correctly set up and calibrated 	
12	Unable to calculate intersect point (ad- just angle)	 Repeat the process Check if the CAPTRON TCP is correctly set up and calibrated 	
13	Invalid intersect point (adjust angle)	 Repeat the process Check if the CAPTRON TCP is correctly set up and calibrated 	
14	Adjust angle outside tolerance	 Check if the TCP is correct Adjust the tolerances accordingly 	
21	Input low on reference position (check)	 Check if the TCP is correct Check the electrical wiring Check if the CAPTRON TCP is correctly set up and calibrated 	
31	Immerse motion Z failed, inputs not high	 Check if the TCP is correct Check the electrical wiring Check if the CAPTRON TCP is correctly set up and calibrated 	
999	Unknown		

6 Index

6.1 List of Figures

Fig. 1: Home screen	5
Fig. 2: Select Settings	5
Fig. 3: Add URCap	6
Fig. 4: Select URCap on USB device	6
Fig. 5: Restart the robot	7
Fig. 6: URCap successfully installed	7
Fig. 7: Remove the URCap	8
Fig. 8: Installation page	9
Fig. 9: Robot ID	9
Fig. 10: Enter license key	.10
Fig. 11: Valid license	.10
Fig. 12: Open setup wizard	.10
Fig. 13: Setup wizard step 1	.11
Fig. 14: Setup wizard step 2	.12
Fig. 15: Setup wizard step 3	.13
Fig. 16: Setup wizard step 4	.14
Fig. 17: Setup wizard step 5	.14
Fig. 18: Setup wizard step 6	.15
Fig. 19: Setup wizard step 7	.15
Fig. 20: Open Setup Wizard for editing	.16
Fig. 21: Rename CAPTRON TCP	.16
Fig. 22: Enter name for CAPTRON TCP	.17
Fig. 23: Delete CAPTRON TCP	.17
Fig. 24: Setup Wizard Parameters	.18
Fig. 25: URCap Settings	.19
Fig. 26: Calibrate CAPTRON TCP manually	.20
Fig. 27: Insert CAPTRON ACTION	.21
Fig. 28: CAPTRON ACTION TCP Check	.22
Fig. 29: CAPTRON ACTION TCP Validate	.23
Fig. 30: CAPTRON ACTION TCP Recalibrate	.24
Fig. 31: CAPTRON ACTION Basic Settings	.25
Fig. 32: CAPTRON ACTION Tolerances	.26
Fig. 33: CAPTRON ACTION Assignment	.27
Fig. 34: CAPTRON ACTION Enable Error Handling	.28
Fig. 35: CAPTRON ACTION Disable Error Handling	.29
Fig. 36: Script Functions	.30