

inline process density and viscosity monitoring

Rheonics Coagutrack Pro

Coagutrack Device Specification:

Doc ID: CTK-PRO-2412

Covers sensor Types: SR, SRV, SRD, DVP, DVM

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1 Before you begin

1.1 About the manual

This manual provides information on Coagutrack software. This document specifies all the device features and documents Coagutrack software implementation details. Important, this manual assumes that the following conditions apply:

• The sensor has been installed correctly and completely according to the installation instructions.

- The installation complies with all applicable safety requirements.
- The user is trained in government and corporate safety standards.

1.2 Purpose

This specification is designed to complement the Coagutrack Manual by providing a complete, unambiguous description of this Field Device from a COAGUTRACK SOFTWARE Communication perspective

1.3 Who should use this document?

The specification is designed to be a technical reference for COAGUTRACK SOFTWARE End Users. This document assumes the reader is familiar with COAGUTRACK SOFTWARE Protocol requirements and terminology.

1.4 Warning

Before connecting the COAGUTRACK SOFTWARE in an explosive atmosphere, make sure instruments in the loop are ordered and installed in accordance with intrinsically safe or nonincendiary field wiring practices. Explosions can cause serious injury or death. Review Rheonics Ex Manual at <u>https://rheonics.com/resources/manuals/</u>.

1.5 Nomenclature

Abbreviation (short form)	Full-term	Meaning
SRV	Symmetric Resonator Viscometer	Viscosity sensor
SRD	Symmetric Resonator Densitometer	Density and Viscosity sensor
RCP	Rheonics Control Panel	Software for data acquisition and configuration
SME	Smart Module Electronics	Sensor electronics

Table 1. Defined Acronyms

1.6 Related Documentation

You can find all product documentation on the Rheonics website at https://rheonics.com/resources

2 Minimum System Requirements

Operating System: Windows 7 or Higher (Windows 10 recommended) **Required:** LabVIEW Run-Time Engine 2019. Included in the full installer. *This run-time engine is also available online at:*

https://www.ni.com/es-cr/support/downloads/software-products/download.labviewruntime.html#348045

Free Disk Space: 2 GB (For full installation including run-time engines)

RAM: 4GB

3 Coagutrack Ethernet connectivity setup

3.1 Instrument overview:

The Coagutrack system has an Ethernet port that can be used for communication with the management level, the default IP V4 address used in this case is xxx.xxx.xxx. The Ethernet port can be found at the top section of the cabinet (Figure 2)



Figure 1. Coagutrack Ethernet port.

3.2 Ethernet PIN assignment Coagutrack Software

RJ45 Connector	Receptacle	Pin Number	Wire Color	Description
	1 8	1	Yellow	Transmit+
		2	Orange	Transmit-
		3	White	Receive+
THURSDAY A		4		Not Used
China		5		Not Used
		6	Blue	Receive-
		7		Not Used
		8		Not Used

4 Modbus in Coagutrack

Coagutrack PRO version comes with the Modbus communication protocol included to be able to view data from each station as well as start and stop jobs, and execute a cutting process. To use this protocol, first connect through ethernet or Wi-Fi, then configure the IP address and port on your application with the following configuration:

IP Address: IP of the RPS (can be seen in Diagnostics module) **Port:** 502

The complete and detailed list of registers will be included with the system or can be requested to support team, below, you will find a summary of the various types of register that the software manages, detailing each category and its specific purpose within the system:

• **INPUT REGISTERS:** These registers are read only registers, these registers have the client and server version, the job information of each station, the measurement values of each station and an error status code and description, these are mapped as follows:

Name	Register addresses
Client version	[0 - 7]
Server version	[8 - 15]
Job information for Station 1	[100 - 130]
Measurement for Station 1	[132 - 157]
Job information for Station 2	[200 - 230]
Measurement for Station 2	[232 - 257]
Job information for Station 3	[300 - 330]
Measurement for Station 3	[332 - 357]
Job information for Station 4	[400 - 430]
Measurement for Station 4	[432 - 457]
Job information for Station 5	[500 - 530]
Measurement for Station 5	[532 - 557]
Job information for Station 6	[600 - 630]
Measurement for Station 6	[632 - 657]
Error Status	700
Error Description	[701 - 716]

Table 2 Input registers distribution

• HOLDING REGISTERS: These registers are used to create jobs for any station, these registers are mapped as follows:

Name	Register addresses
Station Number	0
Job ID	1
Date	[2 - 3]
Ref Job ID	4
Cheese	[5 - 6]
Operator	[7 - 8]
Target Cut Firmness	9
Target Cut Firmness Value	[10-11]
Rennet Timer	12
Rennet Timer Value	[13 - 14]
Stop Alert	15
Stop Alert Value	[16 - 17]
Create	18

Table 3. Holding registers distribution

• **COILS REGISTERS:** These registers are used to start a job, stop a job and perform a cut process for each station, these are mapped as follows:

Name	Register addresses
Start Job 1	10
Cut Job 1	11
Stop Job 1	12
Start Job 2	20
Cut Job 2	21
Stop Job 2	22
Start Job 3	30
Cut Job 3	31
Stop Job 3	32
Start Job 4	40
Cut Job 4	41
Stop Job 4	42
Start Job 5	50
Cut Job 5	51
Stop Job 5	52
Start Job 6	60
Cut Job 6	61
Stop Job 6	62

Table 4. Coils registers distribution

5 OPC UA server in Coagutrack

OPC UA (OPC Unified Architecture), is a platform-agnostic standard created to facilitate the secure exchange of data between industrial machines. It was designed with security as a core principle. One of the key security features of OPC UA is ensuring the integrity and confidentiality of messages through encryption and signing.

The Rheonics Coagutrack can be supplied with an OPC UA server upon request. An OPC UA server is a software application that implements this protocol to provide and manage access to industrial data and control systems. To ensure data protection, the management level and control level are separated by a firewall.



Figure 2. OPC UA network with Coagutrack system

5.1 Reference to other instruments.

Manuals and guides for digital instruments are modular. General instructions give information about the functioning and installation of instruments. Operational instructions explain the use of the digital instrument features and parameters. Fieldbus-specific information explains the installation and use of the instrument on that Fieldbus network. Related manuals are listed next and can be found at <u>https://rheonics.com/resources</u>

5.2 OPC UA Foundation

The OPC Foundation is an organization that develops and maintains standards for open connectivity of industrial automation devices and systems. The foundation's primary goal is to ensure interoperability between various automation and control systems, regardless of the manufacturer. It oversees the development of the OPC (OLE for Process Control) standards, including the OPC Unified Architecture (OPC UA), which provides a framework for secure and reliable data exchange in industrial environments. The OPC Foundation supports collaboration between industry stakeholders to promote the adoption and implementation of these standards. More information can be found at: https://opcfoundation.org/

5.3 Encryption modes

OPC UA offers several security modes: "None," "Sign," and "SignAndEncrypt." The "None" security mode can only be used with the None security profile and is disabled for all other

security profiles. The choice between "Sign" and "SignAndEncrypt" depends on the Cyber Security Management System (CSMS)

Allowed encryption modes are the following:

Security Policy	Description	CSMS
None	No security is applied. The messages are exchanged without any encryption or signing.	
Basic128Rsa15	Uses 128-bit encryption with RSA-15 for message encryption and signing. It provides a basic level of security.	Suitable for applications with moderate security requirements.
Basic256Sha26	Uses 256-bit encryption with SHA-256 for message encryption and signing. It provides a higher level of security than Basic128Rsa15.	Suitable for applications with higher security requirements.
Aes128_Sha366_RsaOaep	Uses AES-128 for encryption, SHA-256 for hashing, and RSA OAEP for key exchange. It provides robust security by combining modern encryption and hashing algorithms.	Suitable for applications requiring strong security measures, including secure communication and data protection.

Table 5. OPC UA encryption modes

6 Getting started with OPC UA

6.1 Components

- Coagutrack system
- OPC UA client. UA Expert
- Windows 10 64 bit
- Ethernet Switch



Below is a set of steps that show how to integrate the Coagutrack system with a OPC UA Expert as a reference, you can follow similar steps to integrate your preferred OPC UA Enabled device.

6.2 System Connections

Connect the Coagutrack system and the computer with the OPC UA client with an Ethernet Cable to the same Ethernet network (follow the Main Coagutrack Manual on how to assign IP).



Figure 3. Coagutrack system connected to OPC UA Client

6.3 Adding a new server

Open UA Expert and add a new server.

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6.4 Selecting the Coagutrack server

When selecting the Coagutrack server, we can use the custom discovery and select the endpoint from the Coagutrack server based on the default configuration.



Figure 5. Selecting Coagutrack server based in the provided endpoint.

6.5 Selecting the Security mode

Once the Coagutrack server has been selected, we can select the encryption and security level used for communication.



Figure 6. Selecting encryption mode.

6.6 Checking the Coagutrack version with UA expert

All Rheonics Coagutrack system can read configuration version for each control system. Available data like Software revision, hardware revision, Manufacturer and model is also available.

1	1122	10110-10110	ALCO/CO. Co. I			100.046	24.24.02.004	24.24.02.040	6		
	10	BHLINKUA	NS9[String]	Measuring 1	1	UINEI6	21:31:02.801	21:31:02.840	Good	DisplayName	, -
	1	I IBHLinkUA	NS9[String]	Operator ID 1	6081393814429200485	UInt64	21:31:02.852	21:31:03.090	Good	Description	
	13	2 IBHLinkUA	NS9 String	Raw Firmness 1	59.2742	Float	21:31:32.561	21:31:32.608	Good	✓ Value	
	1.	B IBHLinkUA	NS9[String]	Ref Job ID 1	42	UInt16	21:31:02.951	21:31:03.090	Good	SourceTimestamp	08/
	14	1 IBHLinkUA	NS9 String	Relative Coagulation spee	0	Float	21:31:03.002	21:31:03.090	Good	SourcePicoseconds	0
	15	BHLinkUA	NS9 String	Rennet Timer 1	0	UInt16	21:31:03.052	21:31:03.090	Good	<	>
Address Space	6 × 16	5 IBHLinkUA	NS9[String]	Rennet Timer Value 1	0	Float	21:31:03.103	21:31:03.341	Good	References	8
C market	1	BHLinkUA	NS9[String]	Setting time 1	0	Float	21:31:03.155	21:31:03.341	Good	G A model	-
	18	B IBHLinkUA	NS9[String]	Start Date 1	1.72045e+09	Float	21:31:03.211	21:31:03.341	Good	- A - Ponas +	
> Error status	1 9	BHLinkUA	NS9 String	Stop Alert 1	0	UInt16	21:31:03.268	21:31:03.341	Good	Reference Target Dis	splayN
 HardwareRevision 	20	BHLinkUA	NS9[String]	Stop Alert Value 1	0	Float	21:31:03.318	21:31:03.341	Good	HasTypeDefiniti PropertyT	ype
 Manufacturer 	21	IBHLinkUA	NS9[String]	Target cut firmness 1	0	UInt16	21:31:03.368	21:31:03.591	Good		
Model	2	BHLinkUA	NS9[String]	Target cut firmness value 1	0	Float	21:31:03.419	21:31:03.591	Good		
RevisionCounter	2	B IBHLinkUA_	NS9 String	Temperature 1	59.2742	Float	21:31:32.918	21:31:33.107	Good		
SerialNumber	24	BHLinkUA	NS9[String]	Time from renneting 1	21216	Float	21:31:31.643	21:31:31.858	Good		
> Server version		IBHLinkUA	NS9[String]	Vcut 1	0	Float	21:31:03.573	21:31:03.591	Good		
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> Station 2	28	BHLinkUA	NS9IString]	HardwareRevisio COTTE	sponding to the Co	adutrak	vstem	21:31:02.337	Good		
> C Station 3	25	BHLinkUA	NS9[String]	Model	en', Coagutrak	LocalizedTex	1 21:30.55.663	21:31:02.337	Good		
> 😂 Station 4	~ 30	BHLinkUA	NS9[String]	SoftwareRevision	1	String	21:30:55.663	21:31:17.137	Good	~	
Log											8
¥ 🖯											
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08/07/2024 Reference Pl IBHLinkUA.	Browse succ	eeded.									
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Figure 7. Coagutrack version.

6.7 Adding Coagutrack Stations

A fully operational Coagutrack OPC UA system, integrated with an OPC UA client like UA Expert, allows users to visualize stations within the Coagutrack system and select the nodes they wish to monitor. This information can also be displayed by dragging and dropping the desired station from the Address Space menu to the main dashboard (see Figure 8).

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Chapter 6 Getting started with OPC UA



Figure 8. Dragging and dropping Coagutrack stations into the OPC UA client.

With this procedure now all readable variables are available in the OPC UA client and can be used for monitoring the coagulation process. See figure 9.

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✓	t				Server	Node Id	Display Name	Value	Datatype	urce Timestar	rver Timestar		Statuscode		000	۲	(
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0	IBHLinkUA@it	hlinkua-01364	4	2	IBHLinkUA	NS9 String	Cheese 1	7163086693731475488	UInt64	16:29:21.614	16:29:21.850	Good					
Y 🗊 D	ocuments			3	IBHLinkUA	NS9 String	Coagulation Acceleration 1	-1.93692	Float	16:30:09.521	16:30:09.623	Good					
	Data Access V	liew		4	IBHLinkUA	NS9 String	Coagulation Speed 1	4.85723	Float	16:30:09.572	16:30:09.623	Good					
	Data Access V	fiew-1		5	IBHLinkUA	NS9 String	Cutting fimmess 1	0	Float	16:29:21.766	16:29:21.850	Good					
				6	IBHLinkUA	NS9[String]	Cutting time 1	0	Float	16:29:21.816	16:29:21.850	Good					
				7	IBHLinkUA	NS9 String	Date 1	1.72045e+09	Float	16:29:21.867	16:29:22.101	Good					
				8	IBHLinkUA	NS9 String _	Firmness 1	62.9405	Float	16:30:10.081	16:30:10.122	Good					
				9	IBHLinkUA	NS9[String]	Job ID 1	43	UInt16	102321.967	16:29:22.101	Good					
				10	IBHLinkUA	NS9[String]	Measuring 1	1	UInt16	16:29:22.017	16:29:22.101	Good	* 600	cu.	roku	cood	
				11	IBHLinkUA	NS9[String]	Operator ID 1	6081393814429200485	UInt64	16:29:22.068	16:29:22.101	Good	Coa	qui	lak I	eau	
				12	IBHLinkUA	NS9 String	Raw Firmness 1	62.8483	Float	16:30:09.876	16:30:10.122	Good		9	II.		
				13	IBHLinkUA	NS9 String	Ref Job ID 1	42	UInt16	16:29:22.169	16:29:22.352	Good		d	ata		
Address Spac	p.		đΧ	14	IBHLinkUA	NS9 String	Relative Coagulation spee	0	Float	16:29:22.220	16:29:22:352	Good		-	References		8.3
Tan Hanharda			~	15	IBHLinkUA	NS9[String]	Rennet Timer 1	0	UInt16	16:29:22.271	16:29:22.352	Good			6 - 2	A Pressed 1	
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	 SerialNuml 	ber		20	IBHLinkUA	NS9 String	Stop Alert Value 1	0	Float	16:29:22.528	16:29:22.602	Good					
. >	Server ven	non		21	IBHLinkUA	NS9 String	Target cut firmness 1	0	UInt16	16:29:22.577	16:29:22.602	Good					
	 SoftwareRe 	rvision		22	IBHLinkUA	NS9 String	Target cut firmness value 1	0	Float	16:29:22.627	16:29:22.852	Good					
,	Station 1			23	IBHLinkUA	NS9 String	Temperature 1	62.8483	Float	16:30:09.977	16:30:10.122	Good					
2	Station 2			24	IBHLinkUA	NS9 String	Time from renneting 1	3132	Float	16:30:10.232	16:30:10.373	Good					
>	Station 3			25	IBHLinkUA	NS9[String]	Vcut 1	0	Float	16:29:22.778	16:29:22.852	Good					
>	Station 4			26	IBHLinkUA	NS9 String	Vmax 1	62.8335	Float	16:29:22.828	16:29:22.852	Good					
.>	Station 5							10000	0.000								
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08/07/2024	DA Plugin	IBHLinkUA	Item INS	9 Strin	iglcoag_rheo.S	tation 1.Temper	ature 1] succeeded : RevisedS	amplingInterval=250, RevisedQueue	Size=1, MonitoredItem	Id=23 [ret = Goo	od]						
08/07/2024	DA Plugin	IBHLinkUA	Item (NS	9 Strin	glcoag_rheo.S	tation 1.Time fr	om renneting 1) succeeded : R	evisedSamplingInterval=250, Revise	dQueueSize=1, Monito	rediternid=24 [re	et = Good]						
08/07/2024	DA Plugin	IBHLinkUA	Item [NS	9 Strin	glooag_rheo.S	tation 1.Vcut 1]	succeeded : RevisedSamplingl	Interval=250, RevisedQueueSize=1,	MonitoreditemId=25 (m	rt = Good]							
08/07/2024	DA Plugin	IBHLinkUA	Item (NS	9 Strin	igicoag_rheo.S	tation 1.Vmax 1	succeeded : RevisedSampling	gInterval=250, RevisedQueueSize=1	MonitoreditemId=26	ret = Good]							
08/07/2024	Server Node	IBHLinkUA	Connecti	ion sta	tus of server 18	BHLinkUA@ibhl	inkua-013644" changed to "Ner	wSessionCreated".									
08/07/2024	Server Node	IRHI inkLIA	Connecti	ion sta	tus of server 18	HI ink! IA @ibbl	iniqua-013644" changed to "Con	nected'									

Figure 9. Coagutrack read variables.

6.8 Station and parameter visualization in UA expert

The following parameters (See table 6) can be visualized for each Coagutrack system.

Name	Unit	Description	Name	Unit	Description
Job ID		Job ID of station	Start Date	UNIX	Measurement Start Date in UNIX for Station
Active		Active status of Job ID of station (0=Inactive, 1=Active)	Time from renneting	seconds	Seconds passed since start of the measurement for Station
Measuring		Measuring status of Job ID of station (0=NotMeasuring, 1=Measuring)	Firmness	сР	Latest Firmness value Station
Date	UNIX	Job creation date in UNIX for station (IEEE754 floating point)	Raw Firmness	сР	Latest Raw Firmness value for Station
Ref Job ID		Reference Job ID for station	Coagulation Speed	cP/s	Latest Coagulation Speed value for Station
Cheese		Cheese name for station (Limited to 2 bytes)	Coagulation Acceleration	cP/s^2	Latest Coagulation Acceleration value for Station
Operator		Operator for station (Limited to 2 bytes)	Temperature	ōC	Latest Temperature value for Station
Target Cut Firmness		Target Cut Firmness Activation	Setting Time	seconds	Setting time calculated value for Station

		(0=Inactive, 1=Active)			
Target Cut Firmness Value	сР	Target Cut Firmness Value (IEEE754 floating point)	Vmax	cP/s	Maximum Coag. Speed value for Station
Rennet Timer		Rennet Timer Activation (0=Inactive, 1=Active)	Cutting Time	seconds	Time of cut value for Station
Rennet Timer Value	seconds	Rennet Timer Value (IEEE754 floating point)	Cutting Firmness	сР	Firmness value at cut for Station
Stop Alert		Stop Alert Activation (0=Inactive, 1=Active)	Vcut	cP/s	Coag. Speed at cut value for Station
Stop Alert Value	minutes	Stop Alert Value (IEEE754 floating point)	Relative Coagulation Speed		Vcut/Vmax in % value for Station

Table 6. OPC UA Parameter station variables

6.9 Job Creation and Valve control

Using UA expert we can also create jobs and modify the overall station configuration, it is also possible to control alarms and valve opening. For more information contact Rheonics support team. This configuration can be found in the OPC UA client a **Create Job** and **Coil**.

Project	F X Data Access Vew Data Access Vew-1					O Attributes	6	×
✓ Ø Project	# Server Node Id Display Name	Value	Datatype	urce Timestar rver Timestan	Statuscode	9 0 8 0		0
✓						Attribute	Value	~
IBHLinkUA@ibhlinkua-013644	42					✓ Nodeld	ns=9;s=c	
✓						Namespace	Index 9	
Data Access View						IdentifierTy	pe String	
Data Access View-1						Identifier	coag_rhe	
						NodeClass	Object	
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						DisplayName	", "Creat	
						Description	BadAttri	
						WriteMark	None	
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> 😅 Create						HasComponent	Station number	
> 🕲 Date						HasComponent	lob ID	
> Description						HasComponent	Create	
> 🕲 Job ID						HasComponent	Date	
> 🙂 Operator						HasComponent	Ref Job ID	
> 📾 Ref Job ID						HasComponent	Cheese	
> 📟 Rennet Timer						HasComponent	Operator	
> 🐨 Rennet Timer Value						HasComponent	Target out Cluma	
> 😅 Station number						HasComponent	Target Cut Firm	¥
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15/07/2024 AddressSpa IBHLinkUA	Browse on node 'ns=9(i=5003' succeeded.							
15/07/2024 AddressSpa IBHLinkUA	Browse on node 'ns=9;s=coag_rheo' succeeded.							
15/07/2024 AddressSpa IBHLinkUA	Browse on node 'ns=9;s=coag_rheo.Create job' succeeded.							
15/07/2024 Attribute PI IBHLinkUA	Read attributes of node 'NS9 String coag_rheo.Create job' succeeded [ret = Goo	d].						
15/07/2024 Keterence PL., IBHLinkUA	Browse succeeded.							
15/07/2024 DA Plunin	Dase DaModel: dronMimeData							U

Figure 10. Job creation and valve control

6.10 Error status and description

Error status and description are also available in Coagutrack OPC UA. Those can be visualized in a OPC UA client by selecting the corresponding node(See Figure 11)

Code	Description
5001	Error creating job
5002	Job not started
5003	The cutting process could not be completed
5004	Job not stopped
5005	Control relay error

Table 7. Error status and description.



Figure 11. Error status and description in Coagutrack OPC UA

7 Profinet in Coagutrack

PROFINET is an open industrial Ethernet system based on international standards and part of IEC 61158 / IEC 61784-2, which defines what the signal looks like on the wire and what the medium accessing the wire has to do, it also uses industrial Ethernet as the physical layer (defined by IEEE802.3). It is a real-time communication protocol, meaning that devices can exchange data in real time with minimal delays. It is also a deterministic protocol, meaning that data is exchanged with predictable latency.



Figure 12. Coagutrack system connected to PROFINET network

7.1 Reference to other instruments.

Manuals and guides for digital instruments are modular. General instructions give information about the functioning and installation of instruments. Operational instructions explain the use of the digital instrument features and parameters. Fieldbus-specific information explains the installation and use of the instrument on that Fieldbus network. Related manuals are listed next and can be found at <u>https://rheonics.com/resources</u>

7.2 PROFIBUS and PROFINET International (PI) association and Rheonics

The PROFIBUS and PROFINET International (PI) association is one of the largest automation organizations in the world and is responsible for PROFIBUS and PROFINET, two important automation technologies.

Rheonics is a member of the PI association as a vendor of hardware, software, and PROFINET-compatible systems.

7.3 IO connection

The IO connections predefined in the GSDML file, offer cyclic connections to 5 Slots the following table lists the IO connections available in the GSDML file of the device, this configuration can vary depending on the number of stations used.

Module ID	Information
Module 1	IN
Module 2	IN
Module 3	IN
Module 4	IN
Module 5	OUT

Table 8. IO connection table Profinet.

8 Getting started with PROFINET and Coagutrack

8.1 Components

- CODESYS software installed
- Coaugtrak system with Profinet enabled
- <u>Rheonics GSD files</u> for Coagutrack systems
- IP address of the Coaugtrak systems
- CODESYS-compatible controller



Below is a set of steps that show how to integrate the Coagutrack system with a Profinet network as a reference, you can follow similar steps to integrate your preferred Profinet Enabled device.

8.2 Installing GSDML file in Codesys

Download the GSD files from Rheonics Support Page and install them in the CODESYS Device Repository with the next steps:

- 1. Go to "Device Repository" in the Tools Menu.
- 2. Select the "Edit Locations" option.

3. Click on "Install" and indicate the path to the GSD files on the PC, write a name for the file, and click OK.



Figure 13. Adding Coagutrack GSDML file to the repository

Library Manager W	4	uReabytes coagutrak_profinet_1 X	PLC_PRG	coagutrai	c_profinet					
PLC_PRG (PRG)	General	5 The bus is not running. The shown values are p	perhaps not acti	al						
🖹 🔂 🍪 MainTask	PNIO Module I/O Mapping	Find Filter S	how all			- 🖶 Add FB for IO Channe	el * Go to Instance			
PLC_PRG	PNIO Module JEC Objects	Variable	Mapping	Channel	Address %IB3141	Type ARRAY [0., 127] OF BYTE	Current Value Only subelements upd	Prepared Value	Unit	Description
PN_Controller.	Setus	Application.GVL.Rheonics.rValue.Mzint2		Input[0]	%83141	BYTE	16#00			
C C Ethemat (Ethemat)		Application.GVL.Rheonics.rValue.Mzint1	٠,	Input[1]	9683142	BYTE	16#00			
= 1 PN Controller (PN-Cont	2 - Chinacon	- **		Input[2]	%IB3143	BYTE	16#00			
S G kill av X Cut		-**		Input[3]	%IB3144	BYTE	16#00			
- 9 B Rb Conv		*		Input[4]	%IB3145	BYTE	16#00			
O D Rate				Input[5]	%183146	BYTE	16#00			
S O H dvp V Delete				Input[6]	%183147	BYTE	16#00			
- G II Centre				Input[7]	%183148	BTIE	16#00			
Add Obj	ct	•								
Add Fold	8						Application	Type	Va	ue
Julii 101	adas Disanasir						Device Applicatio	0		
- O I Acknow	uge blaghosis									
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	edge Diagnosis Subtree									
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C C C C C C C C C C C C C C C C C C C	edge Diagnosis Subtree ct ct With									
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Acknow Acknow Coll Edit Obj Edit 10 n Edit 10 n Import n	edge Diagnosis Subtree ct ct With apping appings from CSV	6								
Acknow Acknow Coll Co	edge Diagnosis Subtree ct ct With apping appings from CSV appings to CSV	6								
Acknow Acknow Fill Pri Edit Obj Edit IOn Edit IOn Edit IOn	edge Diagnosis Subtree ct ct With appings from CSV pipings to CSV	6								
Acknow Acknow C II C III C IIII C III C IIII C III C III C III C III C IIII C IIIII C IIIIII C IIIIII C IIIIII C IIIIII C IIIIII C IIIIIII C IIIIIII C IIIIIII C IIIIIII C IIIIIIII C IIIIIIIII C IIIIIIIIII	edge Dugnosis Subtree ct ct With apping appings from CSV appings to CSV	6								

5,6. Right-click on "PN_Controller" and select "Scan for Devices"

Figure 14. Scanning devices

7. Wait some seconds until the software detects all connected devices (SME). If you have one or multiple devices connected, you can click "Copy All Devices to Project" or individually select the ones you want to add and click "Copy to Project".

- -	GVL 🔗 D	UT 😤 uRealBytes	coagutrak_profinet_1	K PLC_PRG	coagut	rak_profinet						
Library Manager A PLC PRG (PRG)	General	Find		Filter Show all			Add FB for IO	Channel *	Go to Instance			
E 🗱 Task Configuration	PNIO Module I/O M	Scan Devices						o ×	Current Value belements upd	Prepared Value Unit	Description	
PLC_PRG	PNIO Module IEC C	Scanned Devices										
Den Proline Controller.	Status	Device name	Device type	Station Name	ID number	MAC Address	IP Address	Subnet	-			
		€ dvp c03 0203	Rheonics SMET	srv-testunit3	16#00000001	70 B3 D5 D2 03 A6	192.168.1.25	255.255				
= 😏 🗊 Ethernet (Ethernet)	Information	*- srv_ht_coil_2	Rheonics SMET	srv-ht-coil-3	16#00000001	70:83:D5:D2:AE:52	192.168.1.3	255.255				
= 🤹 📆 PN_Controller (PN-Cont		i€- srv_f01_0111	Rheonics SMET	srv-srv-f01-0111	16#00000001	70:B3:D5:D2:03:A7	192.168.1.20	255.255.				
B G H srv_ht_col_5 (Rhee		li€-srv_a01_0105	Rheonics SMET	srv-a01-0105	16#00000001	70.B3.D5.D2:12:11	192.168.1.13	255.255.				
Diagnostics (Dia		li€- srv_ht_coil_5	Rheonics SMET	srv-ht-coil-5	16#00000001	70:B3:D5:D2:04:1C	192.168.1.22	255.255.				
Device_Parame		 coagutrak_profinet 	MGate 5103 (serial_no_4739)	coagutrak-profinet	16#02000000	00:90:E8:C2:CC:5F	192.168.1.61	255.255.				
= 😔 📋 dvp_c03_0203 (Rhe			*									
• • • • • • • • • • • • • • • • • • •									latevariables Use	parent device setting		
=					Ad	d Coad	utrak		latevariables Use	parent device setting		
○ ↓ dup_c03_0203 (Phe					Ad	d Coag	utrak		latevariables Use	parent device setting		
 					Ad	d Coag	<u>utrak</u>		latevariables Use	parent device setting		
 I drg.c03_0203 (Pike I drg.c03_0203 I drg.c03_0	Watch 1	¢			Ad	d Coag syster	utrak n	>	Jatevariables Use	parent device setting		•
= () 1 drp_c03_c003 (k/m	Watch 1 Expression	٢			Ad	d Coag syster	utrak n	>	Jatevariables Use	parent device setting Type	Value	•
(*) U drg. 023,020 (*) (*) drg. 023,0203, (*) drg. 023,023,020,023,023,023,023,023,023,023,	Watch 1 Expression PLC_PRGJVar	¢ I&M Auto-IP <	> Reset Blink LED Set Nam	e and IP _ Show or	ly unnamed statio	d Coag syster	utrak n	> project	Application Device.Appleation	parent device setting Type	Value	•
= 6 kg drg_03_000 k kg 6 drg_03_000 kg 9 drg_03_000 kg 9 drg_03_000 kg 6 drg_03_000 kg 6 drg_00 kg 6 drg_00 kg 1 d	Watch 1 Expression PLC_PRGJVar	< i>i&M Auto-IP < Product: RH test_unt3 SK	> Reset Blink LED Set Nam RV (0x0001)	e and IP	ly unnamed station	d Coag syster	utrak n how differences to	> project	Application Device.Application	parent device setting	Value	•
= + + + + + + + + + + + + + + + + + + +	Watch 1 Expression PLC_PRGJVar	K Iskin Auto-IP Keesense Product: RH test_unt3 59 Vender: Rheenics Graht Role: PHO Device	> Reset Blink LED Set Nam RV (0x0001) (0x0644)	e and IP	ly unnamed statio	d Coag syster	utrak n how differences to	> project	Application Device.Application	parent device setting	Value	•
= (+) d (+_0,01,003) (++ (-) d (+_0,01,003) (-) d (+_0,01,003) (-) d (+_0,01,003) (-) d (-)	Watch 1 Expression PLC_PRGJVar	K I&M Auto-IP K Product: RH test, unt3 S Vendor: Rheenis GribH Refe: PHE0 Device	> Reset Blink LED Set Nam RV (0x0001) (0x0644)	e and IP . Show on	ly unnamed station	d Coag syster	utrak n how differences to	> project	Application Device.Application	parent device setting	Value	•
= + ₩ d ₁₀ , d0, 203 8 km ← 0 ₩ d ₁₀ , d0, 203 8 km ← 0 ₩ d ₁₀ , d1, 203 8 km ← 0 ₩ d ₁₀ , d1, 11 km ← 0 ₩ d ₁₀ , d1, 11 km ← 0 ₩ d ₁₀ , d1, 12 km ← 0 ₩ d ₁₀ , d1, 2 km ← 0 ℝ d ₁₀ , d1, 2 km ← 0 ₩ d ₁₀ , d1, 2 km ← 0 ℝ	Watch 1 Expression PLC_PRGJVar	€ I&M Auto-IP €↔	> Reset Blink LED Set Nam RV (0x0001) (0x0644)	e and IP (Show on	ly unnamed statio	d Coag syster	utrak n how differences to	> project	Application Device Application	parent device setting Type	Value	•
= ← ₩ de_c01_003 Bite ← ∅ de_c01_003, ← ∅ de_c01_003,	Watch 1 Expression PLC_PRGJVer	K ISM Auto-IP Ker Product: RH test_unt1 Sf Vendor: Rheenis GnHH Rele: PHED Device Scan Devices	> Reset Blink LED Set Nam RV (0x0001) (0x0044)	e and IP Show or	ly unnamed station		utrak n how differences to	> o project	Application Device.Application	parent device setting	Value	•
= + + y d ₁₀ , c0, 203 Bev ← (d ₁₀ , c0, 203 Bev ←	Watch 1 Expression PLC_PRGJVar	K I&M Auto-IP K Product: RH Lest_unt 30 Preduct: RHeart Jones Graht Role: PHED Device Scan Devices	> Reset Blink LED Set Nam ev (0x0041) (0x0441)	e and IP _ Show or	Ad	d Coag syster	utrak n how differences to	> project	Application Device.Application	parent device setting	Value	•
= + ₩ d ₁₀ , c0, 203 BHr ← ∅ d ₁₀ , c0, 203 BHr ← ∅ d ₁₀ , c0, 203, 203, ← ∅ d ₁₀ , c0, 203, 204, ← ∅ d ₁₀ , c0, 201, 201, 201, ← ∅ Decore, Parame = − ∅ d ₁₀ are 1A, cod, 2, 2 ← ∅ d ₁₀ are 1A, cod, 2, 3 ← ∅ d ₁₀ are 1A, cod, 2, 4 ← ∅ d ₁₀ are 1A, cod, 2, 4 ← ∅ d ₁₀ are 1A, cod, 2, 4 ← ∅ d	Watch 1 Expression PLC_PRG_IVar	EtM Auto-IP < Product: RH test_un13 SP Vender: Rheared and Note: PHIC Device Scan Devices	> Reset Bink LED Set Nam SV (0x0001) (0x0044)	e and IP . Show or	Ad ty unnamed statio	d Coag syster	utrak n how differences to	> project	Application Device Application	parent device setting	Value	•
= + ₩ dr ₀ , dt, 203 Biel ← ₩ dr ₀ , dt, 21 Biel ← ₩ dr ₀ , dt, 20 Biel	Wetch 1 Expression PLC_PRG.IVer	< I&M Auto-IP ++ Product: RH tet_unt1 35 Wendor: RH tet_unt1 35 Wendor: RH tet_unt1 35 Scan Devices	> Reset Blink LED Set Nam RV (0x001) (0x0644)	e and IP . Show or	ly unnamed static	d Coag syster	utrak n how differences to	> project	Application Device Application	parent device setting	Value	•
= 0 + 10 + 0,000 0 + 0 + 0 + 0,000 0 + 0 + 0 +	Wath 1 Expression PLC_PRGJVar	c RM Auto-IP ← → Preder: Britest_ant12 Preder: Britest_ant12 P	> Reset Blink LED Set Nam N (0x0644)	e and IP . Show on	ly unnamed statio	d Coag syster	utrak n how differences to	> project	Application Device.Application	parent device setting	Value	-

Figure 15. Adding Coagutrack system to Profinet network

Upon successful addition of the devices, they will appear in the Project's tree. Verify each device has a unique IP address, station name and MAC address on the network. IP and MAC addresses on each device should be the same as the ones shown on the RCP software.

8.3 Parameter byte table for Profinet Mapping

Coagutrack Profinet system transfer data frames based in the configuration prepared for the system see Table 8.

Each variable must be mapped accordingly to get the correct value for the input data. Each Coagutrack system delivers data of error status and the station parameters and those are divided in modules. A maximum of 3 stations are allowed in Profinet. Only the 3 first modules are used for parameter reading.

Coagutrack data is distributed as follows in 4 different modules:

Module 1:

Coagutrack variable	Index	Data format	Bytes	Word
				endianness
Error Status	0	Unsigned Int16	2	
Job ID 1	2	Unsigned Int16	2	N/A
Active 1	4	Unsigned Int16	2	N/A
Measuring 1	6	Unsigned Int16	2	N/A
Date 1	8	Float32	4	Little Endian
Ref Job ID 1	12	Unsigned Int16	2	N/A
Cheese 1	14	Unsigned Int16	2	
Operator 1	16	Unsigned Int16	2	
Target Cut Firmness	18	Unsigned Int16	2	N/A
Target Cut Firmness Value 1	20	Float32	4	Little Endian
Rennet Timer 1	24	Unsigned Int16	2	N/A
Rennet Timer Value	26	Float32	4	Little Endian
Stop Alert 1	30	Unsigned Int16	2	N/A
Stop Alert Value 1	32	Float32	4	Little Endian
	36	Reserved	2	
Start Date 1	38	Float32	4	Little Endian
Time from renneting 1	42	Float32	4	Little Endian
Firmness 1	46	Float32	4	Little Endian
Raw Firmness 1	50	Float32	4	Little Endian
Coagulation Speed 1	54	Float32	4	Little Endian
Coagulation Acceleration 1	58	Float32	4	Little Endian
Temperature 1	62	Float32	4	Little Endian
Setting Time 1	66	Float32	4	Little Endian
Vmax 1	70	Float32	4	Little Endian
Cutting Time 1	74	Float32	4	Little Endian
Cutting Firmness 1	78	Float32	4	Little Endian
Vcut 1	82	Float32	4	Little Endian
Relative Coagulation Speed	86	Float32	4	Little Endian
Job ID 2	90	Unsigned Int16	2	N/A

Active 2	92	Unsigned Int16	2	N/A
Measuring 2	94	Unsigned Int16	2	N/A
Date 2	96	Float32	4	Little Endian

Module 2:

Coagutrack variable	Index	Data format	Bytes	Word
				Endianness
Ref Job ID 2	0	Unsigned Int16	2	N/A
Cheese 2	2	Unsigned Int16	2	
Operator 2	4	Unsigned Int16	2	
Target Cut Firmness 2	6	Unsigned Int16	2	N/A
Target Cut Firmness Value 2	8	Float32	4	Little Endian
Rennet Timer 2	12	Unsigned Int16	2	N/A
Rennet Timer Value 2	14	Float32	4	Little Endian
Stop Alert 2	18	Unsigned Int16	2	N/A
Stop Alert Value 2	20	Float32	4	Little Endian
	24	Reserved	2	
Start Date 2	26	Float32	4	Little Endian
Time from renneting 2	30	Float32	4	Little Endian
Firmness 2	34	Float32	4	Little Endian
Raw Firmness 2	38	Float32	4	Little Endian
Coagulation Speed 2	42	Float32	4	Little Endian
Coagulation Acceleration 2	46	Float32	4	Little Endian
Temperature 2	50	Float32	4	Little Endian
Setting Time 2	54	Float32	4	Little Endian
Vmax 2	58	Float32	4	Little Endian
Cutting Time 2	62	Float32	4	Little Endian
Cutting Firmness 2	66	Float32	4	Little Endian
Vcut 2	70	Float32	4	Little Endian
Relative Coagulation Speed 2	74	Float32	4	Little Endian
Job ID 3	78	Unsigned Int16	2	N/A
Active 3	80	Unsigned Int16	2	N/A
Measuring 3	82	Unsigned Int16	2	N/A
Date 3	84	Float32	4	Little Endian
Ref Job ID 3	88	Unsigned Int16	2	N/A
Cheese 3	90	Unsigned Int16	2	

Module 3:

Coagutrack variable	Index	Data format	Bytes	Word
				Endianness
Cheese 3	0	Unsigned Int16	2	
Operator 3	2	Unsigned Int16	2	
Target Cut Firmness 3	4	Unsigned Int16	2	N/A
Target Cut Firmness Value 3	6	Float32	4	Little Endian
Rennet Timer 3	10	Unsigned Int16	2	N/A
Rennet Timer Value 3	12	Float32	4	Little Endian
Stop Alert 3	16	Unsigned Int16	2	N/A
Stop Alert Value 3	18	Float32	4	Little Endian
	22	Reserved	2	
Start Date 3	24	Float32	4	Little Endian
Time from renneting 3	28	Float32	4	Little Endian
Firmness 3	32	Float32	4	Little Endian
Raw Firmness 3	36	Float32	4	Little Endian
Coagulation Speed 3	40	Float32	4	Little Endian
Coagulation Acceleration 3	44	Float32	4	Little Endian
Temperature 3	48	Float32	4	Little Endian
Setting Time 3	52	Float32	4	Little Endian
Vmax 3	56	Float32	4	Little Endian
Cutting Time 3	60	Float32	4	Little Endian
Cutting Firmness 3	64	Float32	4	Little Endian
Vcut 3	68	Float32	4	Little Endian
Relative Coagulation Speed 3	72	Float32	4	Little Endian

For holding registers mappings contact the Rheonics Support team.

9 Profibus in Coagutrack

PROFIBUS (Process Field Bus) is a standardized fieldbus communication protocol widely used in industrial automation and process control. It is based on IEC 61158 and IEC 61784 standards, which define fieldbus communication technologies and their specific protocol implementations, including signal characteristics and medium access requirements. Using serial communication over RS-485 or fiber optic networks, it enables efficient data exchange between industrial devices like sensors, controllers, and actuators.

Although considered a predecessor to PROFINET, PROFIBUS remains widely used due to its reliability, compatibility with legacy systems, and proven performance all over the world. Coaugtrack systems can use 1 or more converters depending of the number of stations available.



Figure 16. Coagutrack system connected to Profibus network

9.1 Reference to other instruments.

Manuals and guides for digital instruments are modular. General instructions give information about the functioning and installation of instruments. Operational instructions explain the use of the digital instrument features and parameters. Fieldbus-specific information explains the installation and use of the instrument on that Fieldbus network. Related manuals are listed next and can be found at <u>https://rheonics.com/resources</u>

9.2 PROFIBUS and PROFINET International (PI) association and Rheonics

PROFIBUS (Process Field Bus) is a standardized fieldbus communication protocol widely used in industrial automation and process control. It is based on IEC 61158 and IEC 61784 standards, which define fieldbus communication technologies and their specific protocol implementations, including signal characteristics and medium access requirements. Using serial communication over RS-485 or fiber optic networks, it enables efficient data exchange between industrial devices like sensors, controllers, and actuators. Although considered a predecessor to PROFINET, PROFIBUS remains widely used due to its reliability, compatibility with legacy systems, and proven performance all over the world.

9.3 IO connection

The IO connections predefined in the GSD file, offer cyclic connections to 3 Slots that contains

each station parameters(Addressing to each IO device will contain different modules depending on the number of stations, each station follows the same addressing). The following table lists the IO connections available in the GSD file of the device:

Module ID	Information	Size
Module 1	IN	2
Module 2 (Station 1)	IN	88
Module 3 (Station 2)	IN	88
Module 4	IN	34
Module 5	OUT	62
Module 6	OUT	6
Module 7	OUT	6

Table 9. IO connection table Profibus. Slave 1.

Module ID	Information	Size	
Module 1 (Station 3)	IN	88	
Module 3 (Station 4)	IN	88	

Table 10. IO connection table Profibus. Slave 2.

10 Getting started with PROFIBUS and Coagutrack

10.1 Components

• TIA portal software

- Rheonics GSD files for Coagutrack systems
- Profibus device address
- S7-1200 with CM 1243-5 Master module
- Profibus cable prepared with Profibus connector



Below is a set of steps that show how to integrate the Coagutrack system with a Profibus network as a reference, you can follow similar steps to integrate your preferred Profibus Enabled device.

10.2 Import the MGate 5111 GSD File

A GSD file is a standardized text file that defines the communication parameters of a PROFIBUS or PROFINET device. For the Moxa MGate 5111, it contains details such as device identification, supported baud rates, diagnostic data length, and I/O module configurations. This information is essential for integrating and configuring the MGate 5111 into a PROFIBUS network using TIA Portal.

1, To import the device's GSD file, go to **Options** and select **Manage General Station Description files (GSD)**. Locate the folder containing the GSD file, and TIA Portal will install it into the project, allowing you to add the device to the diagram.



Figure 17. TIA Portal - Import MGate 5111 GSD File

2, Once the GSD file is installed, the new device (Moxa) can be found at Hardware **Catalog**, inside **Other field devices**. Double click it to add the moxa device to the diagram.

coagutrak_prolibustesting + PLC_1 [CPU 1212C DC/DC/DC]	_#=>	Hardware catalog 📰 🕄 🕨
	Topology view 👗 Network view 📑 Device view	Options
🗄 [R.C. 1] (RI 1212C] 🕢 🗐 🔡 🛃 🖽 📆 🕀 🛓	3	2
		w Catalon
		and not
865		
32		Pitter Prote: 2/4/5
N ²⁰		- The second sec
Cr 🚫		PC systems
		🕨 🧰 Drives & starters 👘 👘
		Retwork components
		Detecting & Monitoring
103 102 101 1 2 3		Distributed I/O
Rack_0		Power supply and distribution
State Constraint		T Other field devices
		Additional Ethemet devices
		+ D PROFINETIO
Barris 288 cruns		• 📴 PROFIBUS OP
au date		• 💷 Drives
		• Encoders
		Gatewoys
	8	- With Maria Milata 5111 Photes
		- Mi Kead module
		Moxa MGateS111 3
		III Universal module
		input: 1 Byte
		input: 2 Bytes
		input: 3 Bytes
		input: 4 Bytes
		right S Byer
		input 7 Bytes
		Input: 8 Bytes
		In Viput: 9 Bytes
		Input: 10 Bytes
		input: 11 Bytes
		input: 12 Bytes
		Input: 13 Bytes
		rout 14 Bytes
		input: 15 Bytes
		nout 17 Bytes
	× .	ctivate Wind Wat 188yes
¢ 0	> 138%. 💌 🕂 🤁	A Bettings to Activate Windows
	Properties Linfo Diagnostics	> Information

Figure 18. TIA Portal - Add New MGate 5111 Device

3, The Moxa will be added to the Network View diagram. To create the Profibus Network, drag one port to the another to create a connection.

Make sure to add the Profibus Address set on the Coagutrack system.

Project tree III	s7400coagutrak25111 ⊁ Devices & networks	_ • •
Devices		🛃 Topology view 🛛 🚠 Network view 📑 Device view
19	' 💦 Network 🚺 Connections HM cannection 🔹 🖭 🐺 🐨 🎞 🗐 🔍 ±	3
		^
 57400coagutrak25111 		
Add new device		
📥 Devices & networks	PLC 1 Slave 1 Slave 2	
PLC_1 [CPU 414-3 DP]	CO A 14-5 DP MOXE MGERES 1	-
Device configuration		
😵 Online & diagnostics		
Program blocks		
Technology objects	PROFIBUS_1	
External source files		
PLC tags		
 Des PLC data types 		
Watch and force tables		
Doline backups		
Device proxy data		
Program info		
🕞 PLC supervisions & alarms		
PLC alarm text lists		
Local modules		
Distributed I/O		
Ungrouped devices		
Slave_1		
Image: Slave_2		
Security settings		
Cross-device functions		
Common data		
Documentation settings		
Languages & resources		
Version control interface		
Online access		
Card Reader/USB memory		
✓ Details view		
Module	4	
Name		×
IN Device configuration		> 100%

Figure 19. TIA Portal -PROFIBUS Configuration

4, The PROFIBUS modules must be added as inputs in the project. While the GSD file adds the Moxa device and provides information about available module types and sizes (see figure 20), the actual modules should be manually added to the appropriate device slots. Ensure that the number and sizes of these modules match the PROFIBUS mapping configured on the **MGate 5111** to enable communication.

Chapter 10 Getting started with PROFIBUS and Coagutrack



Figure 20. TIA Portal - MGate 5111 PROFIBUS Module Inputs

5, All modules read by the S7-1200 are mapped to specific addresses assigned when the PROFIBUS module slots were configured. For full operation 2 converters must be added for full 4 station operation and monitoring.

Chapter 10 Getting started with PROFIBUS and Coagutrack

						∎∎×				
	🚰 To	pology	view 朂	Network	view 📑 Devic	e view				
Device overview										
1 Module	Rack	Slot	I address	Q address	Туре	Article no.				
Slave_1	0	0	8189*		Moxa MGate5111 P					
Input: 1 Word_1	0	1	512513		Input: 1 Word					
Input: 44 Words_1	0	2	514601		Input: 44 Words					
Input: 44 Words_2	0	3	900987		Input: 44 Words					
Input: 17 Words_1	0	4	748781		Input: 17 Words					
Output: 31 Words_1	0	5		512573	Output: 31 Words					
Output: 3 Words_1	0	6		574579	Output: 3 Words					
Output: 3 Words_2	0	7		580585	Output: 3 Words					
	0	8								
	0	9								
	0	10								
	0	11								
	0	12								
	0	13								
	0	14								
	0	15								
	0	16								
	0	17								
	0	18								
	0	19								
	0	20								
	0	21								
	0	22								
	0	23								
	0	24								

Figure 21. TIA Portal - PROFIBUS Modules Memory Addresses-Slave 1

							-	₽■×
	📲 Торе	ology vie	ew	<u>.</u>	Network	view	Device	view
Device overview							u	
Y Module	Rack	Slot	I addre	ss	Q address	Туре		Article no.
Slave_2	0	0	8188*			Moxa MG	ate5111 P	
Input: 44 Words_1	0	1	6026	589		Input: 44	Words	
Input: 44 Words_2	0	2	7828	369		Input: 44	Words	
	0	3						
	0	4						
	0	5						
	0	6						
	0	7						
	0	8						
	0	9						
	0	10						
	0	11						
	0	12						
	0	13						
	0	14						
	0	15						
	0	16						
	0	17						
-	0	18						
	0	19						
	0	20						
	0	21						
	0	22						
	0	23						
	0	24						

Figure 22. TIA Portal - PROFIBUS Modules Memory Addresses-Slave 2

6, create tags based on the I/O addressed assigned to the Coagutrack system.

Project tree	E (coagutral	profibustesting + PLC	1 [CPU 1212C]	DC/DC/DC] + P	.C tags 🔸 🕯	Coagutra	k [32]					_ # = ×
Devices												🕢 Tags 🛞 User	r constants
[B]	12	000	+ H ™ BY										1
		Coagu	trak										
Casputrak profibustesting			iame	Data type	Address	Retain	Arces	Witita	Wahl	Comment			
Add new device	1000	1 61	From Status	Word	5400								
A Devices & networks		2 40	Job ID 1	Word	5///68		Ø	Ä					
PLC 1 ICPU 1212C DODODCI	9	3 40	Active 1	Word	54070								
Drvice configuration			Measuring 1	Wined	54072		9						
Q Online & diagnostics		5 40	Date 1	Beal	54074								
Program blocks		6	Ref Joh ID 1	Wined	N4078								
Technology objects	- L	7	Cheese 1	Char	NIRSO								
Faternal source files	- 11		Onerator 1	Char	5,1896		ā	ä	ä				
T PLC toos	0	9 .0	Tarnet Out Firmness 1	Word	540112								
Show all tans	~ I I	10	Target Cut Firmness Value	Real	540114		8	8					
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			Report Timer 1	Ward	200719								
Calculting table [39]			Panent Timer John 1	Deal	100120								
Country and (197)		12 0	formet inner value i	incor	190120								
The B of data boar	- 12		Stop Alert I	Word Deal	500024								
	- 11		Stop Hert Verbe 1	nee/	100120								
Provide read force and force	- 11	12 44	Reserved	wora	DE IVINI								
vestori and loce tables	- 11	10 40	Start Date 1	NESI	940132								
Chine backups		17 💽	Time from renneting 1	Real	%ID136		M	M					
P 22 Traces		18	Perminess 1	Real	%D140								
OPC UA communication		19 🛀	Raw Firmness 1	Real	%D144			M					
 B Device proxy data 	- 11	20 🕣	Coagulation Speed 1	Real	%D148			M					
212 Program info	- 11	21 🚳	Congulation Acceleration 1	Real	NJD152								
PLC elerm text lists		22 🕢	Temperature 1	Real	%ID156				~				
Local modules		23 🗠	Setting Time 1	Real	%ID160								
 Distributed IO 		24 👊	Vmax1	Real	%ID164								
DP-Mastersystem (1): PROFIBUS_1		25 🛥	Cutting Time 1	Real	%D168				M				
 E Ungrouped devices 		26 🗠	Cutting Firmness 1	Real	%/D172								
👻 🔄 Slave_1		27 🕢	Vout 1	Real	%ID176				N				
Y Device configuration	- 11	28 🛥	Relative Coagulation Speed	1 Reel	%ID180								
😼 Online & diagnostics		29 💶	Job ID 2	Word	%W184								
📩 🕅 Slave_1		30 💶	Active 2	Word	%///186								
🚺 Input: 1 Word_1		31 🕢	Measuring 2	Word	%/W188								
Innut: 58 Works 1	Y	32 🖸	Date 2	Real	%JD190								
✓ Details view	-	33			1		(*)	~	Ø.				
Name Detaitype Details Comm	-	33	<866 news		1		2		2		Roperties	nto 🛛 🗓 Diagnostics	
-Q Active 1 Word 3 \$10/70 -	^	Genera											
Active 2 Word %IW186	=	Tag	1				_						-
Cheese 1 Char %i880	- 11	Neces	1	ag				_					
Coagulation Acceleratio Real %ID152 Coagulation Speed 1 Real %ID148	~		1	General							Activat Go to Se	e Windows tings to activate Wine	

Figure 23. TIA Portal - PROFIBUS Modules Mapping

10.3 Parameter byte table for Profibus Mapping

Each variable must be mapped correctly to ensure accurate input data values. Each Coagutrack system provides error status data and station parameters, which are organized into modules. The mapping for each system depends on the number of allowed stations. For base data monitoring, only Modules 1, 2, and 3 are required. Each station uses the same mapping structure as Module 2, detailed below.

Module 1:

Coagutrack variable	Index	Data format	Bytes	Word endianness
Error Status	0	Unsigned Int16	2	

Module 2:

Coagutrack variable	Index	Data format	Bytes	Word endianness
Job ID 1	2	Unsigned Int16	2	N/A
Active 1	4	Unsigned Int16	2	N/A
Measuring 1	6	Unsigned Int16	2	N/A
Date 1	8	Float32	4	Little Endian
Ref Job ID 1	12	Unsigned Int16	2	N/A
Cheese 1	14	Unsigned Int16	2	
Operator 1	16	Unsigned Int16	2	
Target Cut Firmness 1	18	Unsigned Int16	2	N/A
Target Cut Firmness Value 1	20	Float32	4	Little Endian
Rennet Timer 1	24	Unsigned Int16	2	N/A

Rennet Timer Value 1	26	Float32	4	Little Endian
Stop Alert 1	30	Unsigned Int16	2	N/A
Stop Alert Value 1	32	Float32	4	Little Endian
	36	Reserved	2	
Start Date 1	38	Float32	4	Little Endian
Time from renneting 1	42	Float32	4	Little Endian
Firmness 1	46	Float32	4	Little Endian
Raw Firmness 1	50	Float32	4	Little Endian
Coagulation Speed	54	Float32	4	Little Endian
Coagulation Acceleration 1	58	Float32	4	Little Endian
Temperature 1	62	Float32	4	Little Endian
Setting Time 1	66	Float32	4	Little Endian
Vmax 1	70	Float32	4	Little Endian
Cutting Time 1	74	Float32	4	Little Endian
Cutting Firmness 1	78	Float32	4	Little Endian
Vcut 1	82	Float32	4	Little Endian
Relative Coagulation Speed 1	86	Float32	4	Little Endian

11 Ethernet/IP in Coagutrack

Ethernet/IP is an industrial network protocol that adapts the Common Industrial Protocol (CIP) to standard Ethernet. It is a best-in-class Ethernet communication network, enabling users to implement standard Ethernet technologies in industrial automation applications (IEEE 802.3 combined with TCP/IP Suite) while simultaneously enabling Internet and enterprise connectivity to data anywhere. The maximum number of stations allowed for Ethernet/IP communication its 3.



Figure 24. Coagutrack system connected to Ethernet/IP network

11.1 Reference for other instruments.

Manuals and guides for digital instruments are modular. General instructions give information about the functioning and installation of instruments. Operational instructions explain the use of the digital instrument features and parameters. Fieldbus-specific information explains the installation and use of the instrument on that Fieldbus network. Related manuals are listed next and can be found at <u>https://rheonics.com/resources</u>

11.2 ODVA and Rheonics

ODVA is a global organization whose members are among the world's leading automation companies. ODVA's mission is to promote open, interoperable information and communication technologies in the industrial automation sector. ODVA recognizes its media-independent network protocol - the Common Industrial Protocol, or "CIP" - as its core technology and its primary common interest - EtherNet/IP, DeviceNet, CompoNet, and ControlNet.

Rheonics is a member of ODVA organization as a vendor of hardware, software, and Ethernet/IPcompatible systems. Check our membership at this

link: https://marketplace.odva.org/organizations/2885-rheonics-gmbh

11.3 IO connection

The IO connections predefined in the EDS file, we recommend setting the RPI to 3000ms. The following table list the IO connections available in the GSDML file of the device:

IO Connection	Direction (from instrument)	Size Assembly (bytes)		Parameter	Data Type
Exclusive	In	1	426	Device parameters	SINT
Owner	Out	2	77	Output parameters	

Table 11. IO connection table-Ethernet/IP.

12 Getting started with Ethernet/IP and Coagutrack

12.1 Components

- CODESYS software installed
- Coagutrack system with Ethernet/IP enabled
- <u>Rheonics eds files</u> for Coagutrack systems
- IP address of the Coaugtrak systems
- CODESYS-compatible controller



Below is a set of steps that show how to integrate the Coagutrack system with a Ethernet/IP network as a reference, you can follow similar steps to integrate your preferred Ethernet/IP Enabled device.

12.2 Installing EDS file in Codesys

Download the EDS files from Rheonics Support Page and install them in the CODESYS Device Repository with the next steps:

- 1. Go to "Device Repository" in the Tools Menu.
- 2. Select the "Edit Locations" option and select system repository.
- 3. Click on "Install" and indicate the path to the EDS files on the PC and click OK.



Figure 25. Adding Coagutrack eds file to the repository

5,6. Right-click on the Ethernet/IP scanner and select the "Scan for Devices" option. Copy the Coagutrack system into the Codesys project.

- 9 ×	Ethernet 🗙 🎽 HT_COL_3	F01_0111 HT_Col_5 Lest_unit_4 B Ether	let_IP_Scanner 🛛 🏪 test_uni	🕽 🎽 SRV_Viscosity_Meter	Device
femetIP test 2 Device [connected] (CODESYS Control for Raspberry PI S	General	Network interface etho			
Application [run]	Scan Devices		- 🗆 X		
Library Manager PLC_PRG (PRG)	Scanned Devices				
a Task Configuration	Device name	Device type	IP Address Serial Nu		
O Sentration of the sentrat	SRV_Viscosity_Meter	SRV Viscosity Meter(Major Revision=16#1, Minor Revision = 16#1)	192.168.1.11 0 (15#0)		
Control Destructure Service Tack	MGate5105_EtherNet_IP_Adapter	MGete5105 EtherNet/IP Adapter(Major Revision=16#1, Minor Revision = 16#,	192.168.1.62 2968 (16#		
EtherNet_IP_Scanner.ServiceCycle	- SHV_VIICOUTY_Meter_1	SRV viscosity Meterymigor the record (541, Minor Revision + 1641)	192.168.1.139 0 (16#0)		
😑 📀 🅩 MainTask					
· 예 PLC_PRG					
Construction (Ethernet)				The second second second second	
- Unit control the state of the	1			6 Coagutrak	6
Hand State (1997) Manualty Meter					÷
				system	
SiV_Vacantly_Heter_5 (SiV Vacanty Heter)	N				
SRY Jacosty Heler_6 (SRY Waterly Heler)	c		>		
CDV Viscosity Mater (CDV Viscosity Mater)	5.0	_	and the second		
SoftMotion General Axis Pool	5. Scan for	L	onow anterences to project		
6 2 IFC	Scan Day cas	Copy All Devices to Pro	ject Close		
📲 💭 GPICK (A. J. (GPICK A.B.)	devices				
Onewire					
Camera device					

Figure 26. Scanning Coagutrack system from the Ethernet/IP network

Upon successful addition of the devices, they will appear in the Project's tree. Verify each device has a unique IP address, station name and MAC address on the network. IP and MAC addresses on each device should be the same as the ones shown on the RCP software.

12.3 Parameter byte table-Ethernet/IP

Each variable from table 10 must be mapped accordingly to get the correct value for the input data. Each Coagutrack system delivers data of error status and the station parameters. The stations must be mapped after the error status parameter following the format on table 6 where "x" is the station number (1,2,3) and up to byte 346.

General	- unu		Filter show all				HOU FE TOPIO CI	idrifielina Go to	unstan	ce	
Connections	Variable	Mapping	Channel	Address	Type		Current Value	Prepared Value	Unit	Description	-
	· · · · ·		Input Data_Param68	%IB3332	BYTE	9					
Assemblies	÷ 🍫		Input Data_Param69	%IB3333	BYTE	69					
	18 Mg		Input Data_Param70	%IB3334	BYTE	168					
User-Defined Parameters	16 - Mp		Input Data_Param71	%IB3335	BYTE	72					
	E *9		Input Data_Param72	%IB3336	BYTE	96					
Log	±-*•		Input Data_Param73	%IB3337	BYTE	63					
2 AL 110	· · · · ·		Input Data_Param74	%IB3338	BYTE	46					
EtherNet/IP I/O Mapping	(é - 🍫		Input Data_Param75	%IB3339	BYTE	67					
make an advancement of the second	B 🍫		Input Data_Param76	%183340	BYTE	130					
ethernet/IP IEC Objects	÷ 🍫		Input Data_Param77	%IB3341	BYTE	197					
Orahur	18- %		Input Data_Param78	%IB3342	BYTE	46					
- Autor	· · · · ·		Input Data_Param79	%IB3343	BYTE	67					
Information	B-30		Input Data_Param80	%IB3344	BYTE	130					
	÷ **		Input Data_Param81	%IB3345	BYTE	197					
	⊞-¥≱		Input Data_Param82	%IB3346	BYTE	43					
	+ %		Input Data_Param83	%IB3347	BYTE	59					
	(e) - 🍫		Input Data_Param84	%183348	BYTE	112					
	æ 🍫		Input Data_Param85	%IB3349	BYTE	22					
	· 🕀 🦄		Input Data_Param86	%IB3350	BYTE	15					
	÷ 🍫		Input Data_Param87	%083351	BYTE	183					
	(ii) - 🍫		Input Data_Param88	%IB3352	BYTE	184					
	· · · · ·		Input Data_Param89	%IB3353	BYTE	80					
	ie 🍫		Input Data_Param90	%IB3354	BYTE	46					
	÷ *9		Input Data_Param91	%IB3355	BYTE	67					
	· · · · · ·		Input Data_Param92	%IB3356	BYTE	130					
	ie 🍫		Input Data_Param93	%IB3357	BYTE	197					
	96 Mg		Input Data_Param94	%IB3358	BYTE	0					
					-	1					~

🍟 = Create new variable 🌍 = Map to existing variable

Figure 27. Coagutrack data stream.

Coagutrack variable	Index	Data format	Bytes	Word endianness
Error Status	0	Unsigned Int16	2	
Job ID x	2	Unsigned Int16	2	N/A
Active x	4	Unsigned Int16	2	N/A
Measuring x	6	Unsigned Int16	2	N/A
Date x	8	Float32	4	Big mid Endian
Ref Job ID x	12	Unsigned Int16	2	N/A
Cheese x	14	Unsigned Int16	2	
Operator x	16	Unsigned Int16	2	
Target Cut Firmness x	18	Unsigned Int16	2	N/A
Target Cut Firmness Value x	20	Float32	4	Big mid Endian
Rennet Timer x	24	Unsigned Int16	2	N/A
Rennet Timer Value x	26	Float32	4	Big mid Endian
Stop Alert x	30	Unsigned Int16	2	N/A
Stop Alert Value x	32	Float32	4	Big mid Endian
	36	Reserved	2	
Start Date x	38	Float32	4	Big mid Endian

Time from renneting x	42	Float32	4	Big mid Endian
Firmness x	46	Float32	4	Big mid Endian
Raw Firmness x	50	Float32	4	Big mid Endian
Coagulation Speed x	54	Float32	4	Big mid Endian
Coagulation Acceleration x	58	Float32	4	Big mid Endian
Temperature x	62	Float32	4	Big mid Endian
Setting Time x	66	Float32	4	Big mid Endian
Vmax x	70	Float32	4	Big mid Endian
Cutting Time x	74	Float32	4	Big mid Endian
Cutting Firmness x	78	Float32	4	Big mid Endian
Vcut x	82	Float32	4	Big mid Endian
Relative Coagulation Speed x	86	Float32	4	Big mid Endian

Table 12. Mapped variable table for Coagutrack communication.

For holding registers mappings contact the Rheonics Support team.

13 Error status

Error status can be found at the first byte position from OPC UA Server in Coagutrack. The sensor table that is used to determine the status is Table 7.

When using Codesys, the mapped variables can be merged in a single variable by following this procedure.

1 Create a Global, 2 Union type and 3 struct type variables.

levices	• 4 × /	SVL 🎯 DUT 🎯 U	RealBytes coagutrak_profinet_1	× PLC_PRG	lo coagutral	profinet	PN_Controller
Profinet test Profinet test	Control for Darribarry D	General	Find	Filter Show all			- 🛧 Add FB for IO
= 1 PLC Logic	Currant for Naspuerry Fi	min Hadde to Haraka	Variable	Mapping	Channel	Address	Туре
= O Application [run]		PNIO MODULE DO Mapping			Input[65]	%183205	BYTE
= 💭 Coagutrak station 1		PNIC andres C Objects	0.1	and the second second	Input[66]	%183207	BYTE
C DUT (STRUCT)	-	3 Create	a Struct type v	ariable	Input[67]	%183208	BYTE
uRealBytes	-	Status			Input[68]	%183209	BYTE
- 🥌 GVL	-	2 Greate	a Union type w	ariable	Input[69]	%283210	BYTE
Library Manager		In Z. on Cloale	a Union type v	allable	Input[70]	%83211	BYTE
PLC_PRG (PRG)			*		Input[71]	%183212	BYTE
Task Configuration					Input[72]	%183213	BYTE
🖷 😏 😂 MainTask	4	Create d	obal variable		Input[73]	%883214	BYTE
- HI PLC_PRG		in Gradie g	opan danabio		Input[74]	%283215	BYTE
= 😏 😂 Profinet_Con	municationTask		- 19		Input[75]	%183216	BYTE
셴 PN_Control	er.CommCycle		- 19		Input[76]	%083217	BYTE
- G S Profinet_IOT	ask				Input[77]	%183218	BYTE
= 😏 📳 Ethernet (Ethernet)			- *		Input[78]	%83219	BYTE
= 🧐 🔝 PN_Controller (PN-Co	ntroller)		- 9		Input[79]	%283220	BYTE
王 田 Statute River			- %		Input[80]	%/83221	BYTE

Figure 28. Data byte merge- Creating global variables.

4 Create a Global variable with the name uRealbytes(It can be any name).



Figure 29. Global variable from Rheonics.

5 Create the error status variable with the INT data type based on table 7 information.



-

6 Assign the BYTE format based in the word endianness.

GVL	🔷 🖓 DUT 🗙 🔩 uReal	Bytes	coagutrak_profinet_1	PLC_PRG	α
I	TYPE DUT :				
2	STRUCT				
3	Mzintl: BYTE;				
4	Mzint2: BYTE;				
5	END STRUCT	A	Charles and the set		61
6	END TYPE	D ASS	lan the	connect	1
7				eenee	2
	é	form	at haca	d in the	2
					1
			and the second the	A CONTRACTOR OF A	
		WOI	a endia	aness	
		une	a culture		

Figure 31. Ordering byte endianness from error status.

7 In online mode the error status can be visualized.



8 data is mapped in the corresponding module for the parameter.

se 💌	General	Find Filter Show all		 Add FB for IO Channel * Go to Instance 				
	PNIO Module I/O Mapping	Variable	Mapping	Channel Input	Address %IB3141	Type ARRAY [0., 127] OF BYTE	Current Value Only subelements upda	Prepared Va
0	PNIO Module IEC Objects	Application.GVL.Rheonics.rValue.Mznt2		Input[0]	%183141	BYTE	19	
		Application.GVL.Rheonics.rValue.Mzint1	` ø	Input[1]	9683142	BYTE	141	
ice Parameters)	Status	· · · · · · · · · · · · · · · · · · ·		Input[2]	%IB3143	BYTE	5	
ET)		- *		Input[3]	%IB3144	BYTE	36	
ostics)	Information	- **		Input[4]	%183145	BYTE	0	
: Parameters)		- **		Input[5]	%IB3146	BYTE	1	
T)		- **		Input[6]	%IB3147	BYTE	0	
3)		-**		Input[7]	%183148	BYTE	1	
evice Paramete	ariable mappir	0 *		Input[8]	%183149	BYTE	78	
Va		9 -*		Input[9]	%183150	BYTE	205	
		**		Input[10]	%IB3151	BYTE	66	
process)				Input[11]	%183152	BYTE	134	
et)		-**		Input[12]	%IB3153	BYTE	5	
istics)		- **		Input[13]	%IB3154	BYTE	35	
Parameters)		-**		Input[14]	%IB3155	BYTE	99	
				Input[15]	%183156	BYTE	104	
		¥.			100000000000	1		

Figure 32. Variable mapping

14 **Reviews and approvals**

Versior	Nature of changes	Approval	Doc. Id	FW version	Date
1					

15 Notes/Errata

Contact Rheonics support for customization of system settings.

Notes



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inline process density and viscosity monitoring