

Controladores Lógicos Programáveis

DExP
2025

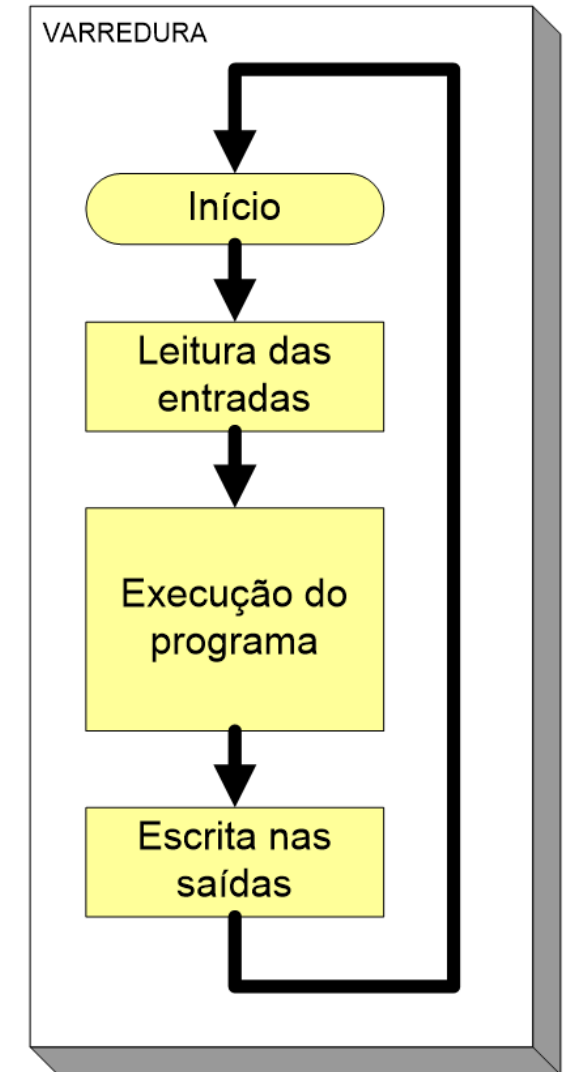
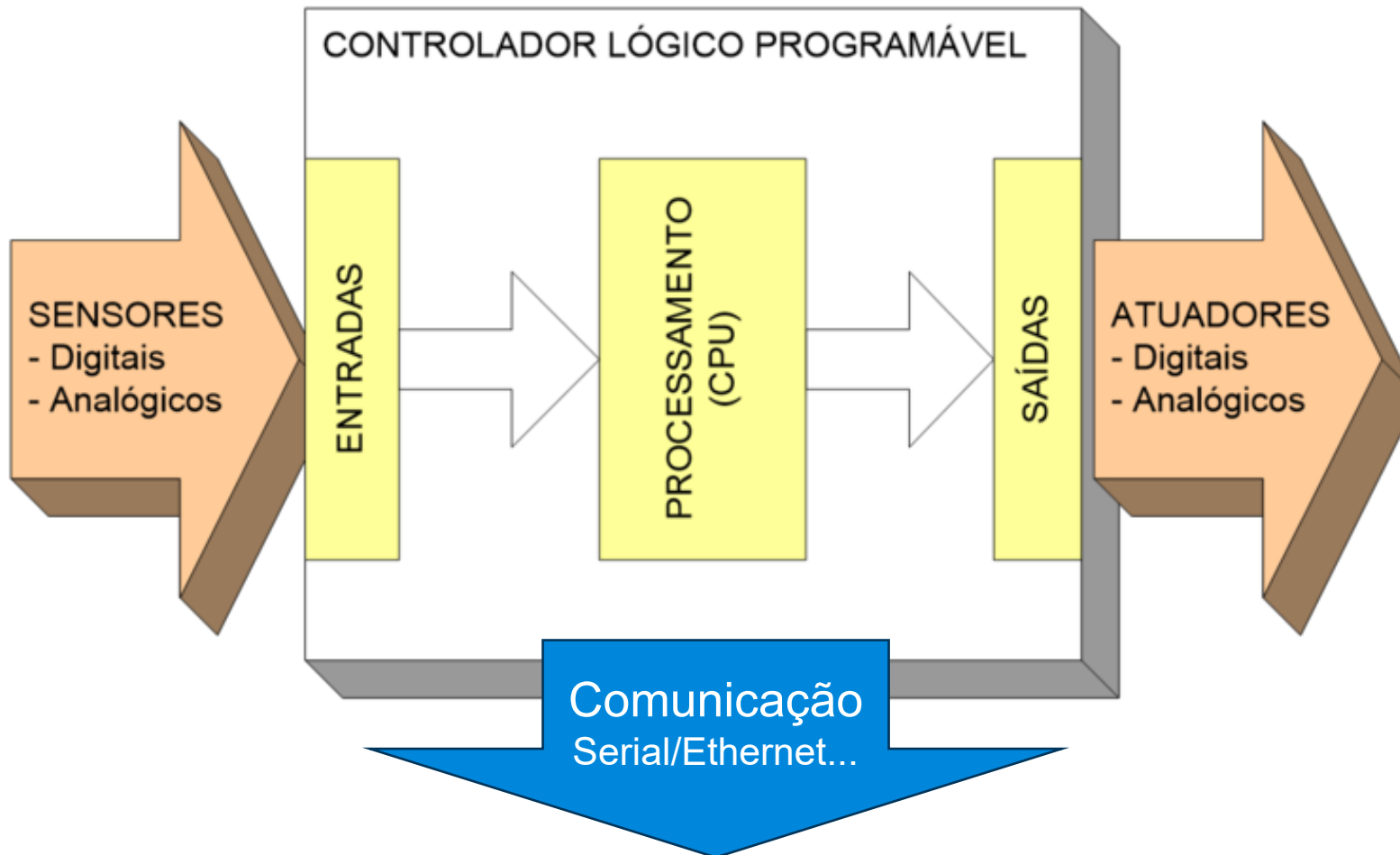


Histórico

- ▶ O primeiro controlador programável foi especificado em 1968 por uma divisão da General Motors Corporation.
- ▶ Objetivo inicial era eliminar o alto custo associado com os sistemas controlados a relés.
- ▶ Requisitos iniciais: Suportar o ambiente industrial, ser facilmente programado e reprogramado, facilidade na manutenção, facilmente expansível e utilizável.
- ▶ Primeiro CLP projetado por Dick Morley em 1 de Janeiro de 1968 que fundou a empresa Modicon (MOdular DIgital CONTroller)



O que é CLP?



O que são sinais elétricos?

(sensores e atuadores)

Sinais de Entrada e Saídas

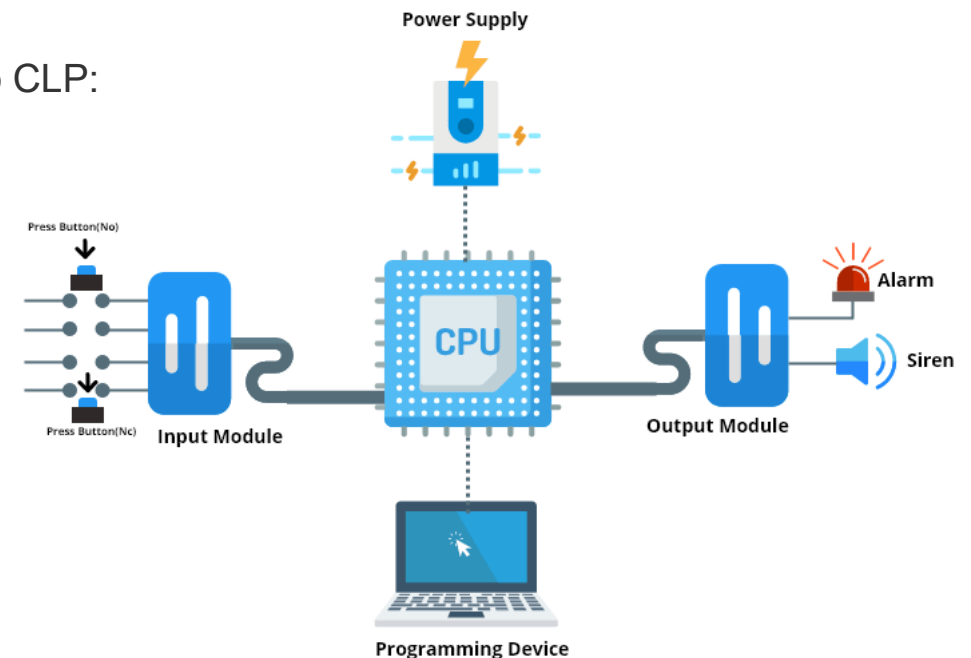
Entradas de um CLP são os pontos de conexão onde são ligados os sensores. Podem ser localizados em módulos, no caso de CLPs modulares, ou estar incorporados no gabinete único, no caso de CLPs compactos.

Entradas do CLP: recebem os sinais analógicos e digitais do sistema. As analógicas permitem a medição de sinais como tensão e corrente, enquanto as digitais atuam em duas variáveis (ligado ou desligado; 0 ou 1; aberto ou fechado), como exemplos das chaves fim de curso, uma botoeira e etc.

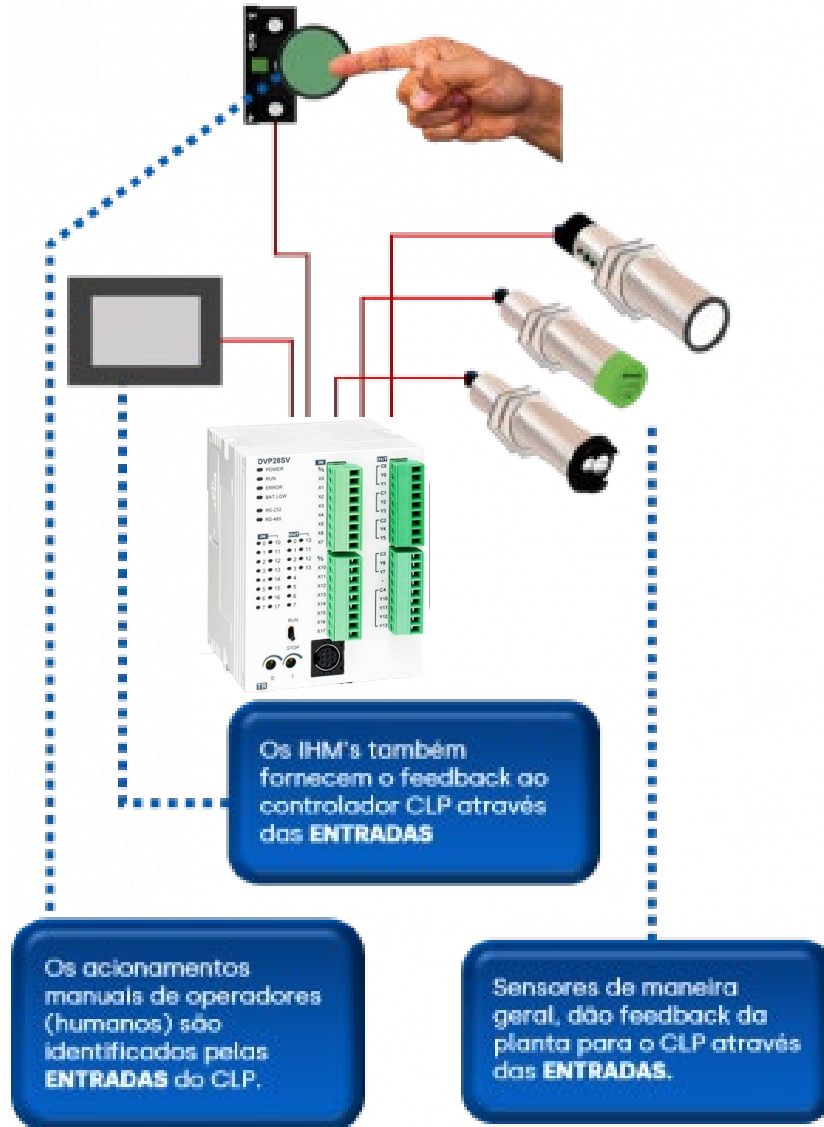
Saídas do CLP: também podem ser analógicas ou digitais e atuam como receptores de ordem, ou seja, como interface onde recebem a informação do CPU e enviam para o processo que deverá ser executado.

Existem diversos **tipos de sensores** e atuadores que podem ser usados no CLP:

- Sensores fim de curso
- Termopares
- Termostatos
- Pressostatos
- Fluxostatos
- Contatores
- Atuadores eletropneumáticos
- Atuadores eletrohidráulicos



Sinais Digitais - Entrada e Saídas



Os acionamentos manuais de operadores (humanos) são identificados pelas **ENTRADAS** do CLP.

Sensores de maneira geral, dão feedback da planta para o CLP através das **ENTRADAS**.

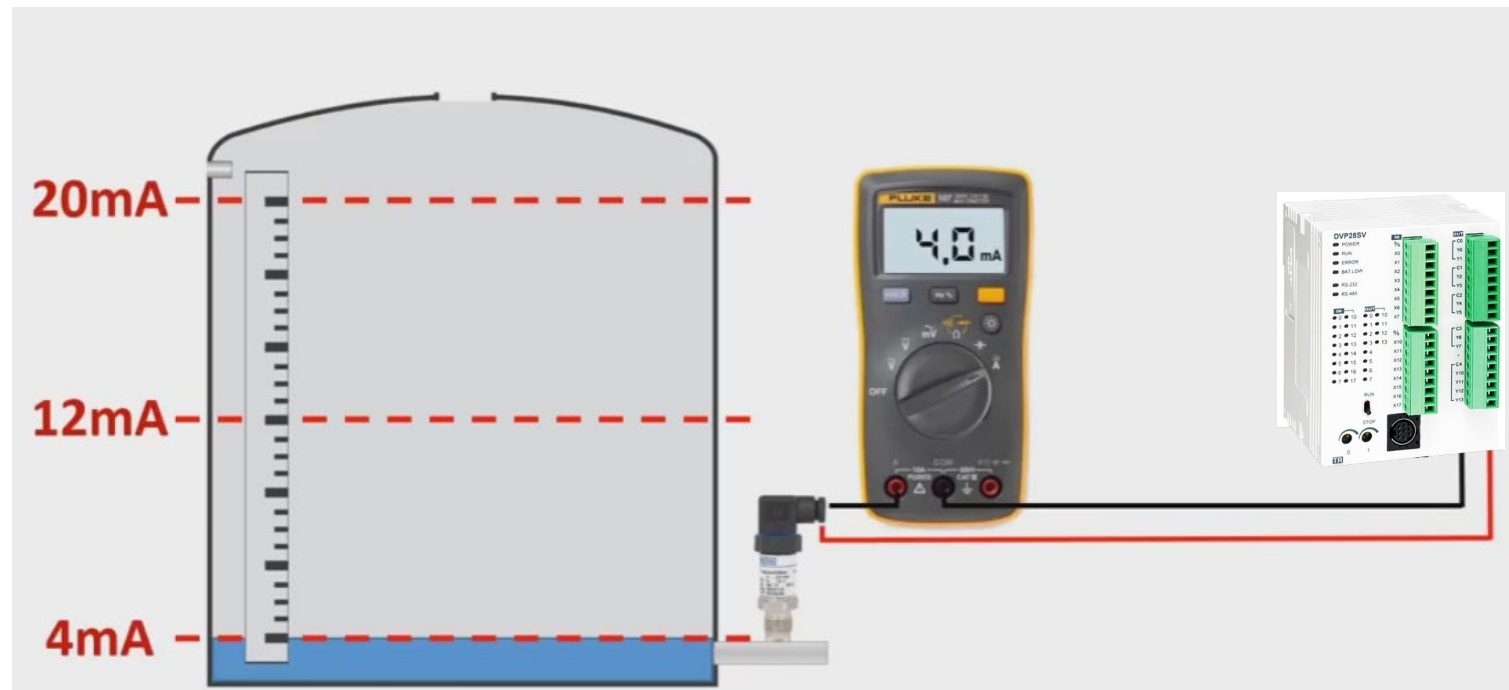
Sinal positivo no comum do cartão.

Sinal negativo no comum do cartão.

Sinais Analógicos - Entrada e Saídas Analógicas

Exemplos de saídas analógicas

- 0 a 5V ou 0 a 10V
- 0 a 20 mA ou 4 a 20mA



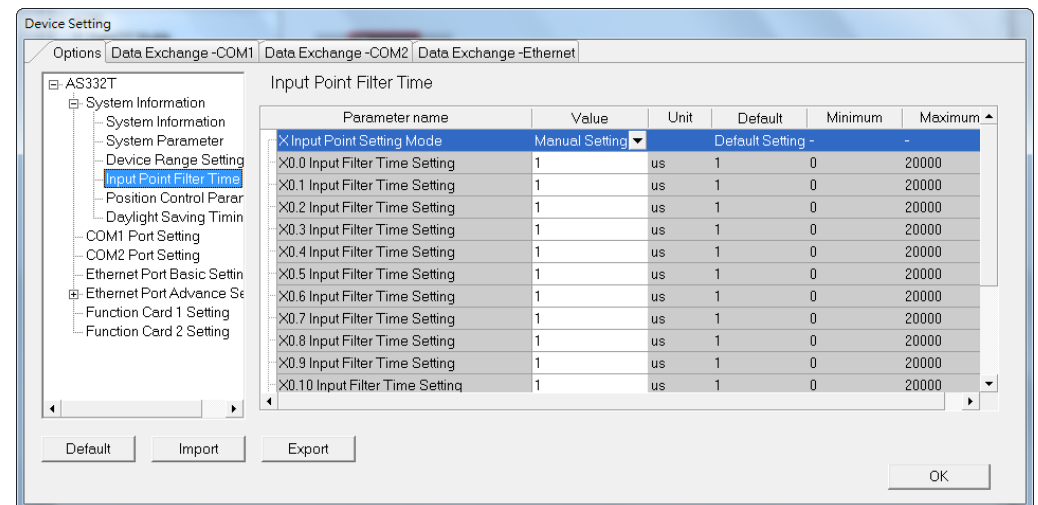
CLP e Entrada Rápida



DVP – até 4 canais em 200kHz
AS - até 6 canais em 200kHz

Programa conta internamente em alta
velocidade

O sinal deve ser 24VC



CLP e Saída Rápida



DVP – até 4 canais em 200kHz
AS - até 6 canais em 200kHz

O sinal deve ser 24VC

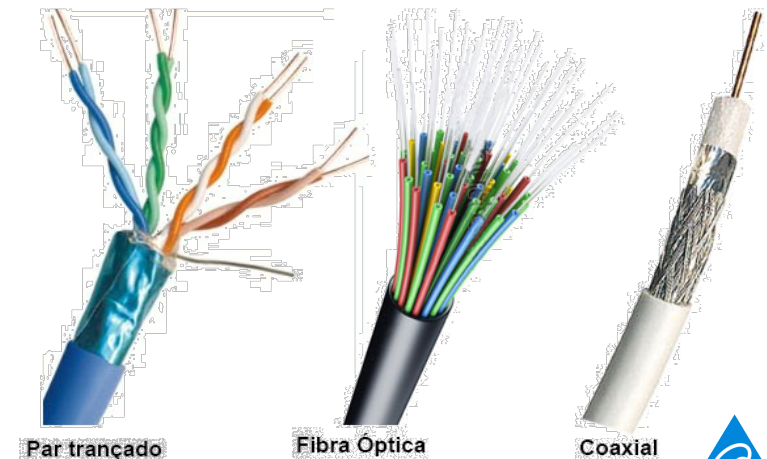
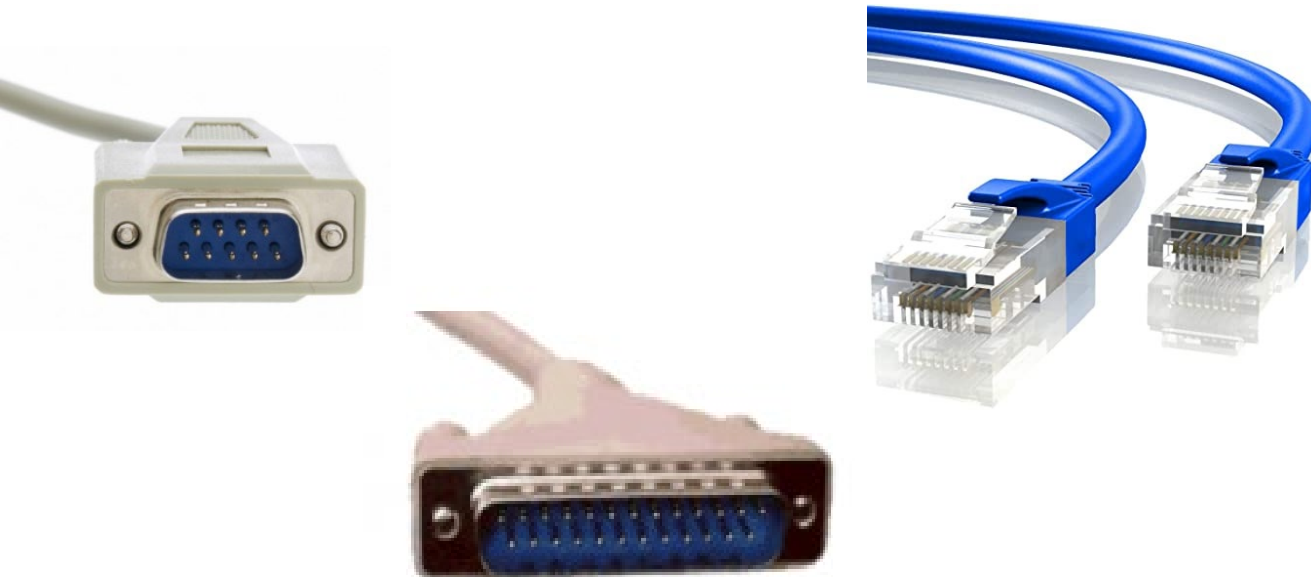


**Servo e Motor de Passo
ou saída PWM**

Interfaces e meio físico

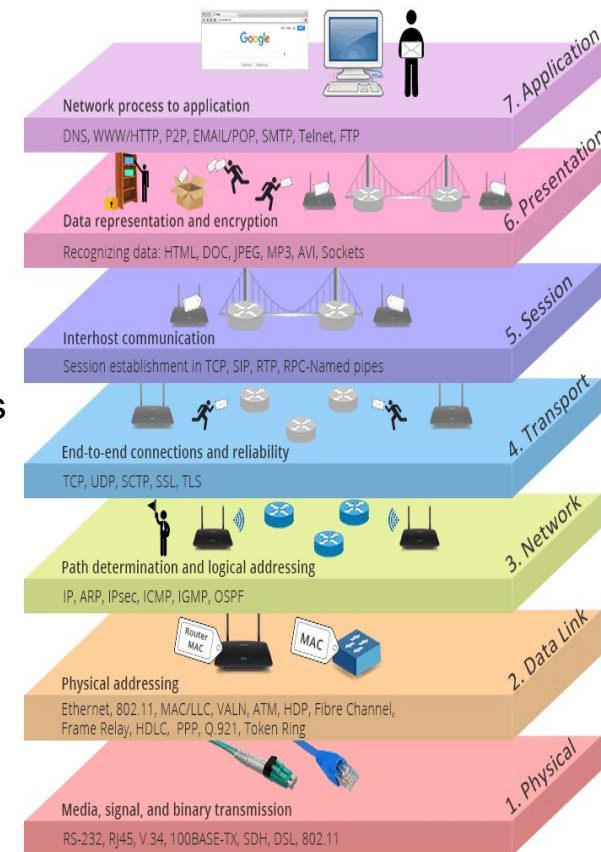
- ▶ Interfaces Seriais:
 - RS232
 - RS485
 - RS422
- ▶ Interface USB
- ▶ Interface Paralelas
- ▶ Tecnologia Ethernet (Camadas OSI)
 - Interfaces cabeadas ou wireless

- ▶ Meio Físico:
 - Par trançado
 - Coaxial
 - Linhas de energia elétrica
 - Fibra Ótica
 - Transmissão sem fio
 - Rádio
 - Micro-ondas
 - Infravermelho
 - Luz visível

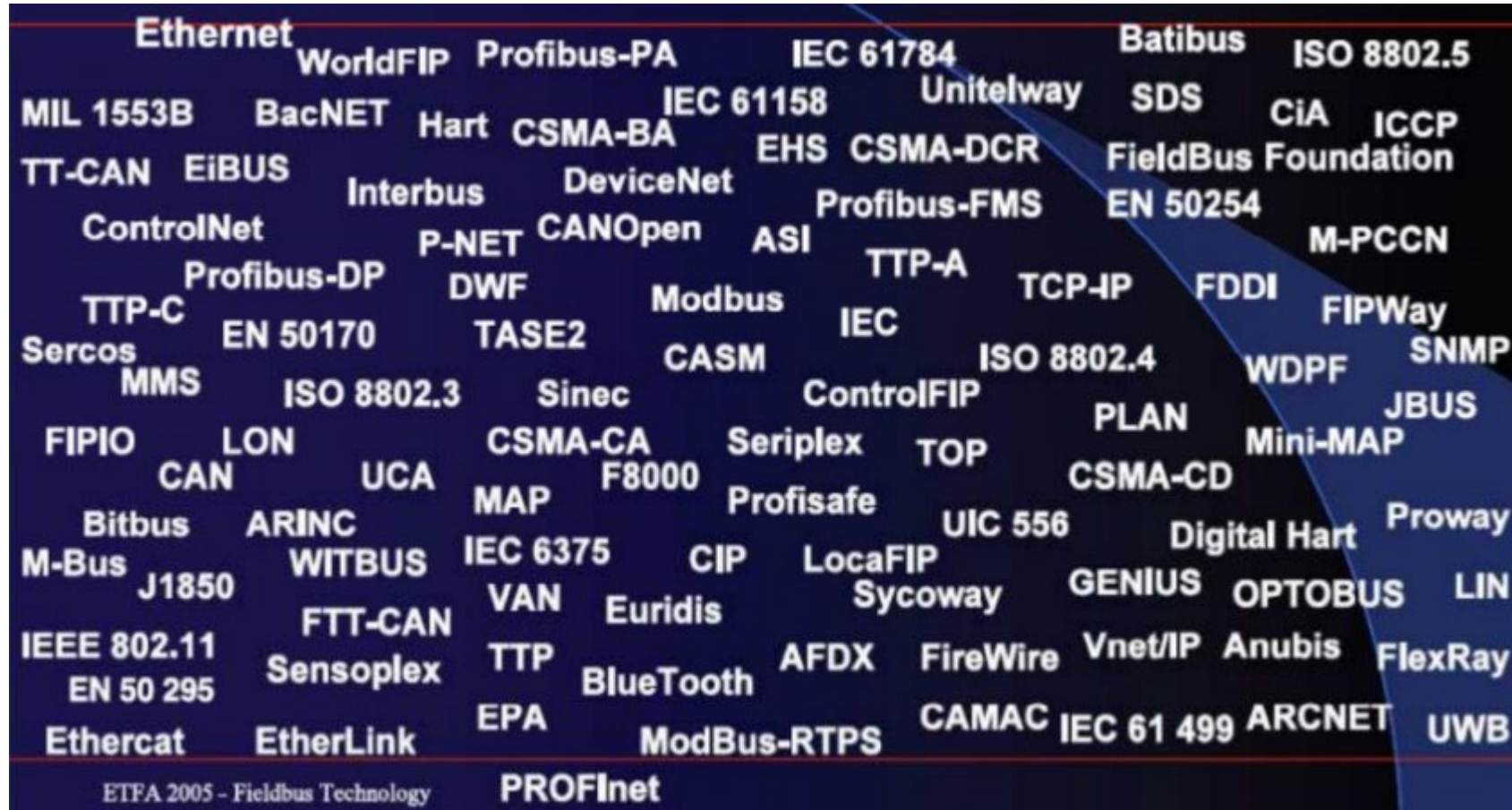


Camadas OSI, TCP e Ethernet

- ▶ De acordo com o modelo OSI (Open Systems Interconnect), um sistema de rede de comunicação é dividido em 7 camadas, como vemos abaixo:
 - Camada Física
 - Camada de Ligação de Dados ou Enlace de Dados
 - Camada de Rede
 - Camada de Transporte
 - Camada de Sessão
 - Camada de Apresentação
 - Camada de Aplicação
- ▶ No Padrão Ethernet com visão de infraestrutura, para isso os componentes de rede serão aplicados nas camadas (1) física, (2) enlace, (3) rede e (4) transporte.
- ▶ Os switches são os principais componentes de uma Rede Ethernet, podem ser gerenciáveis ou não
- ▶ Os Não Gerenciáveis controlam o direcionamento dos dados e gerenciam colisões, de forma a não “travar” a rede.
- ▶ Os gerenciáveis, além das funções básicas, possuem funções de segurança e gerenciamento individual de portas e informações, por exemplo, criação de VLAN Redes Virtuais.



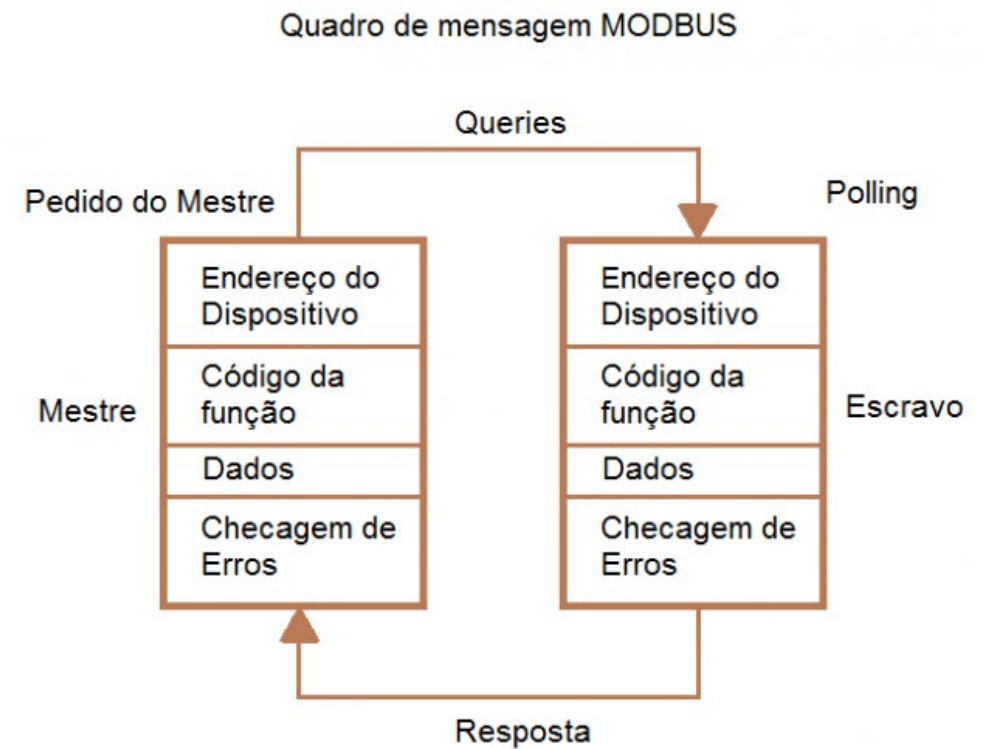
Por que tantos protocolos?



Protocolo de Comunicação



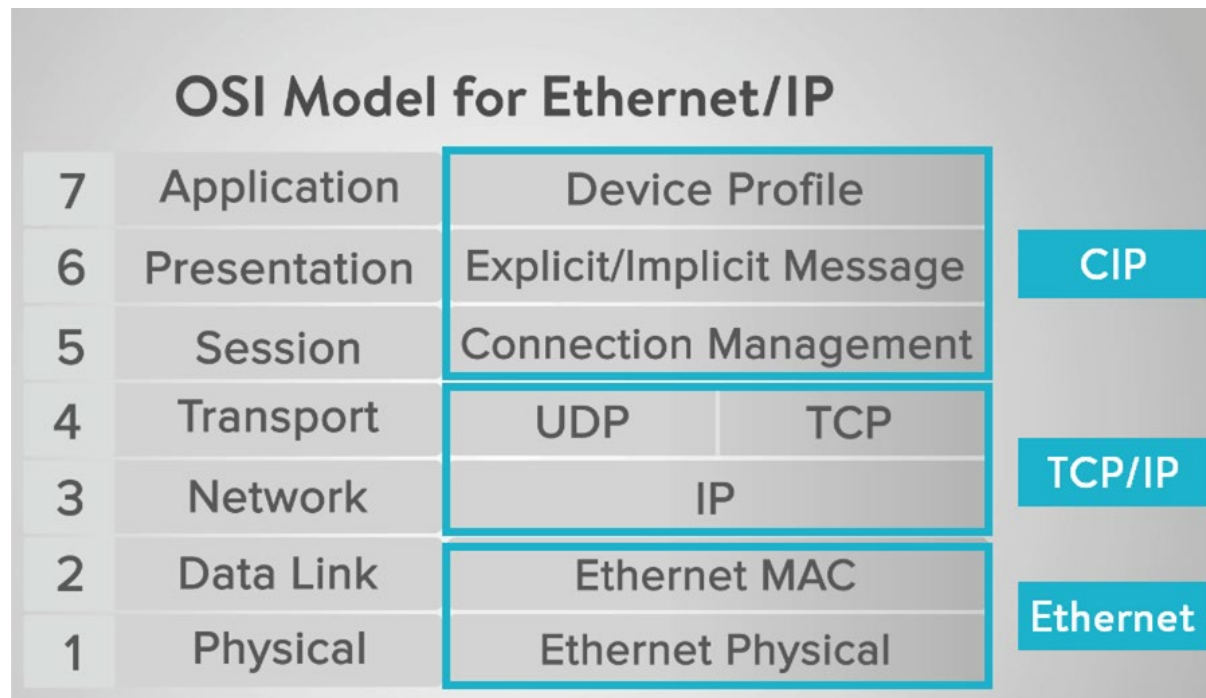
- ▶ Em 1979 a empresa Modicon, hoje Schneider Electric, lançou o protocolo de comunicação Modbus (MODicon Bus), que tornou um padrão de comunicação industrial.
- ▶ Existem 3 padrões:
 - Modbus padrão (RTU e ASCII)
 - Modbus + (Plus)
 - Modbus TCP
- ▶ Interface RS232/RS485/ TCP-IP
- ▶ Tecnologia Mestre-Escravo



Protocolo de Comunicação EtherNet/IP®

- ▶ EtherNet / IP (Ethernet Industrial Protocol) é um protocolo de comunicação, criado pela Rockwell e gerenciado pela associação ODVA
- ▶ EtherNet / IP é um protocolo de camada de aplicação e considera todos os dispositivos na rede como uma série de "objetos".
- ▶ EtherNet / IP baseia-se amplamente utilizado (CIP), que faz um acesso direto aos objetos de redes ControlNet e DeviceNet.

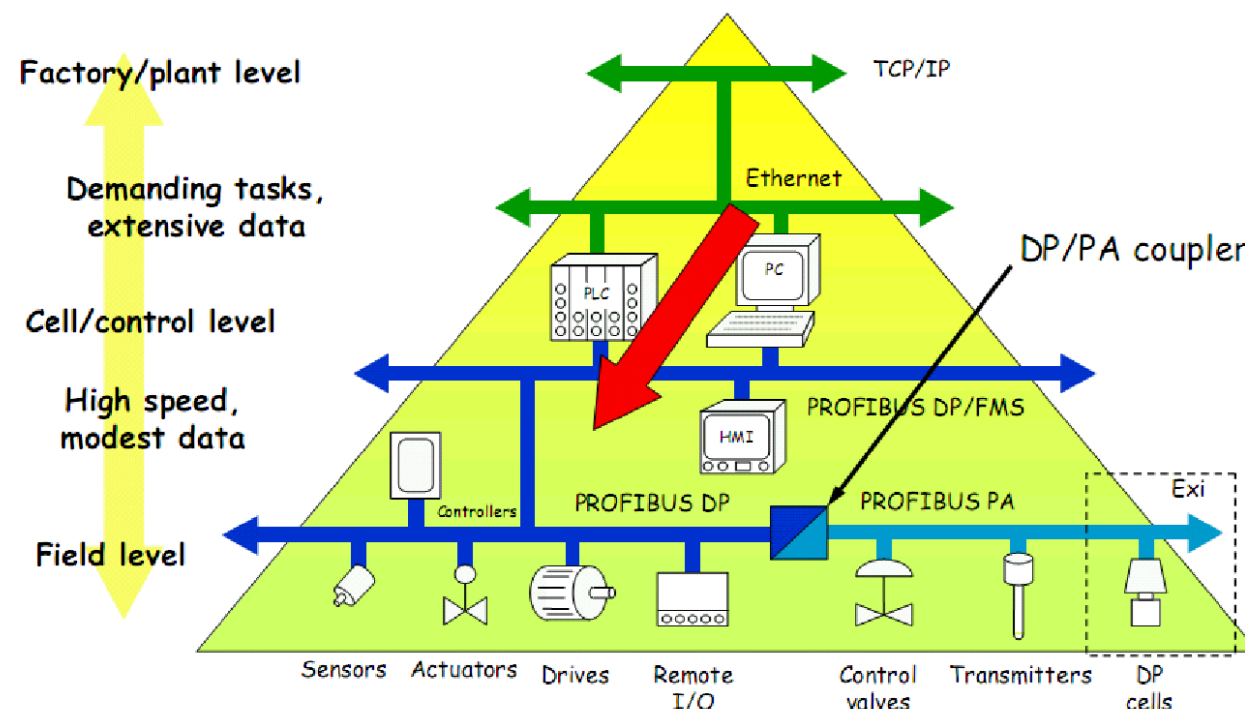
Cuidado!!! EtherNet / IP podem ser facilmente confundida como uma combinação de Ethernet (a camada física, link) utilizado na maioria dos escritórios com muitos ambientes de rede industrial.



Protocolos de Comunicação



- ▶ Introduzido em 1989 pela Siemens na norma DIN 19245, depois adotado pela norma EN 50170;
- ▶ Existem 4 padrões:
 - Profibus DP
 - Profibus FMS
 - Profibus PA
 - Profinet(Profibus p/ Ethernet)
- ▶ Interface RS485, Ethernet ou fibra ótica



Protocolo de Comunicação

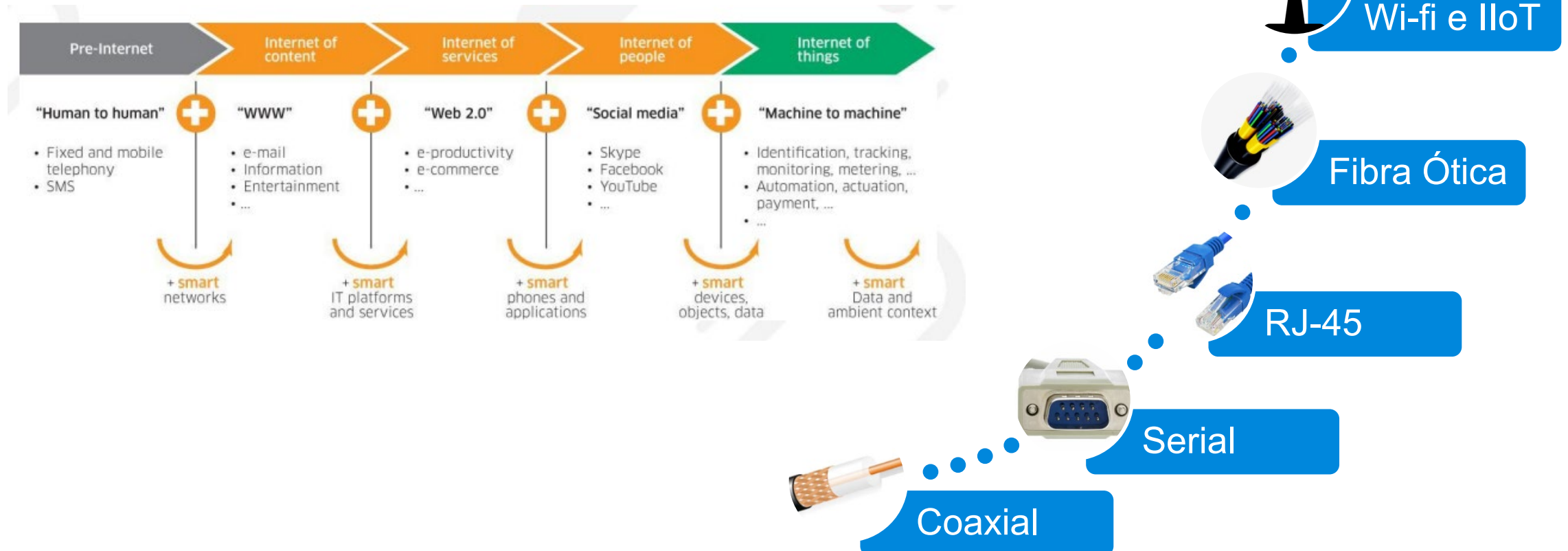


- ▶ Origem em 1983, desenvolvido pela Bosch para a indústria automótiva, baseado na rede CAN
- ▶ Permite uma topologia livre, em bus ou com derivações, cada equipamento pode enviar mensagens sempre que o bus estiver livre
- ▶ Tipo de comunicação entre nós: mestre/escravo, peer-to-peer, broadcast
- ▶ Cabo de par trançado com 2 vias CAN-H e CAN-L

Baud rate (bps)	Max. communication distance (m)
10k	5,000
20k	2,500
50k	1,000
125k	500
250k	250
500k	100
800k	50
1M	25

IoT – Internet das Coisas

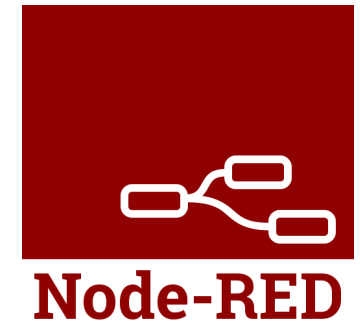
- ▶ Com a facilidade da tecnologia podemos ter redes inteligentes e unificadas
 - MQTT
 - OPC UA



Tecnologias Utilizadas na Coleta e Transmissão de dados

Node-RED

- Plataforma visual de programação para criar aplicativos conectados e automatizados de forma intuitiva.
- Lançado inicialmente em 2013 por Nick O'Leary e Dave Conway-Jones, sendo adquirido pela IBM em 2016 e posteriormente doado à Fundação JS Foundation.



MQTT - *"Transporte de Telemetria com Fila de Mensagens"*

- Protocolo de comunicação leve e eficiente para troca de dados em tempo real entre dispositivos na IIoT.
- Desenvolvido em 1999 por Andy Stanford-Clark, da IBM, e Arlen Nipper, da Eurotech.



Tecnologias Utilizadas na Coleta e Transmissão de Dados

OPC UA

- Evolução do padrão OPC original, desenvolvido pela Microsoft nos anos 1990. Criado para superar limitações e fornecer arquitetura unificada para troca de dados industriais.



- Protocolo de comunicação industrial aberto e independente de plataforma. Permite troca segura de dados, interoperabilidade e integração de sistemas de automação em ambientes industriais.

FTP - “Protocolo de Transporte de Arquivos”

- Desenvolvido por Abhay Bhushan na década de 1970. Criado como uma solução para transferência de arquivos eficiente em redes.
- Permite envio, recebimento e gerenciamento de dados entre um cliente e um servidor.



Linha de Produtos

Séries de CLPs

- **Série AH**

- O CLP da série AH fornece soluções de automação **para aplicações de alto nível**. A combinação de estrutura de hardware modularizado, funções avançadas e o software altamente integrado fornece uma solução de sistema para processar aplicações de controle.

- **Série AS**

- O **CLP compacto modular de faixa intermediária** da série AS da Delta é um controlador **para diversas finalidades com alto desempenho** projetado para todos os tipos de equipamentos automatizados.

- **Série AX**

- A **solução de controle de movimento da Delta é baseada no CODESYS** para integrar as funções de controle de CLPs, IHMs e controladores de movimento em uma plataforma.

- **Série DVP**

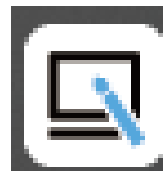
- Os controladores lógicos programáveis da série DVP da Delta oferecem aplicações velozes, estáveis e altamente confiáveis em todos os tipos de máquinas de automação industrial. Além da rápida operação lógica, das instruções abundantes e de diversos cartões de função, **o econômico CLP DVP** também oferece suporte a diversos protocolos de comunicação, conectando o inversor de frequência, servoacionador, interface homem-máquina e controlador de temperatura da Delta a uma “solução Delta” completa para todos os usuários por meio da rede industrial.



Softwares de Programação



ISPSoft



DIADesigner



DIADesigner-AX



Série AH



Série AS



Série AX

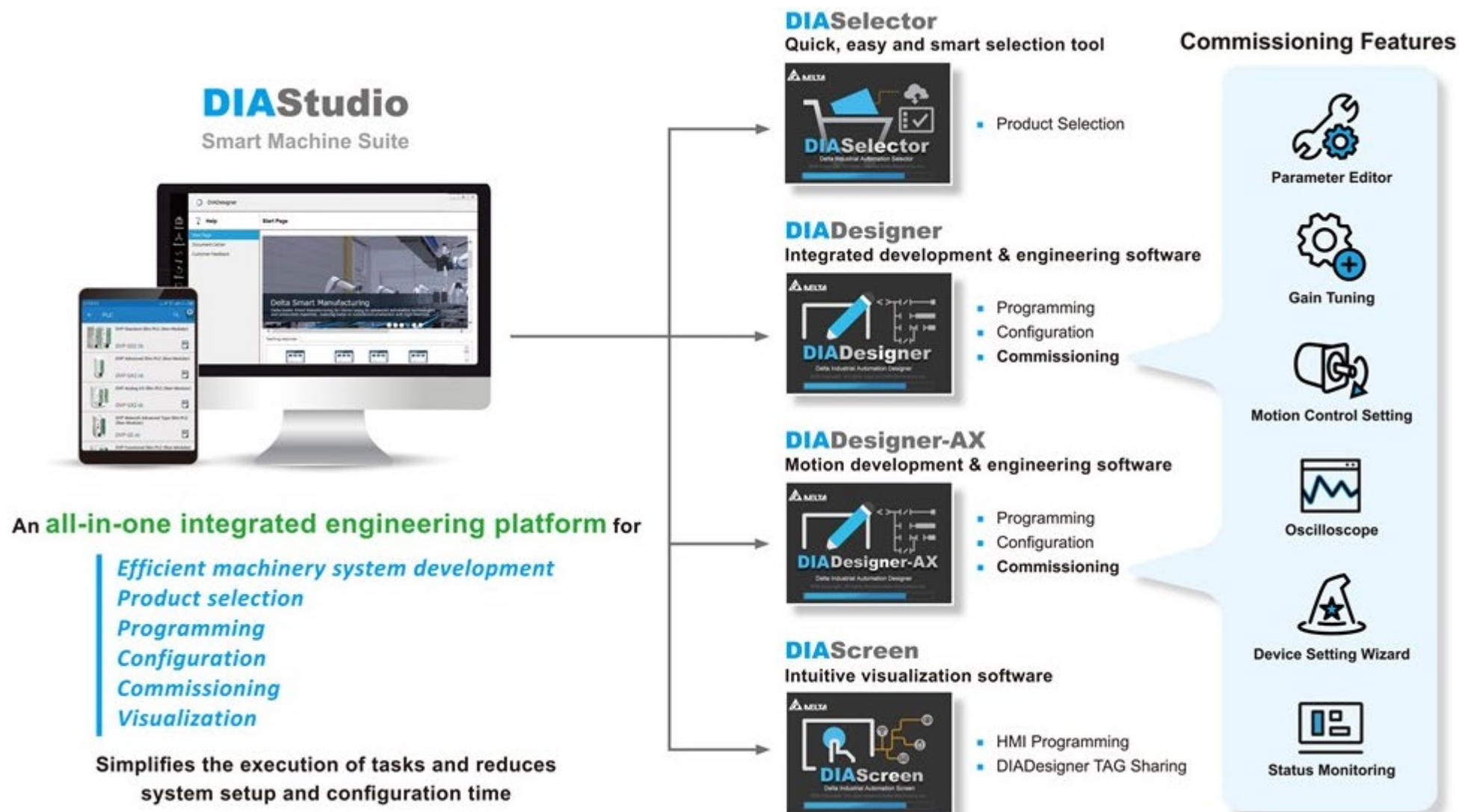


Série DVP V2



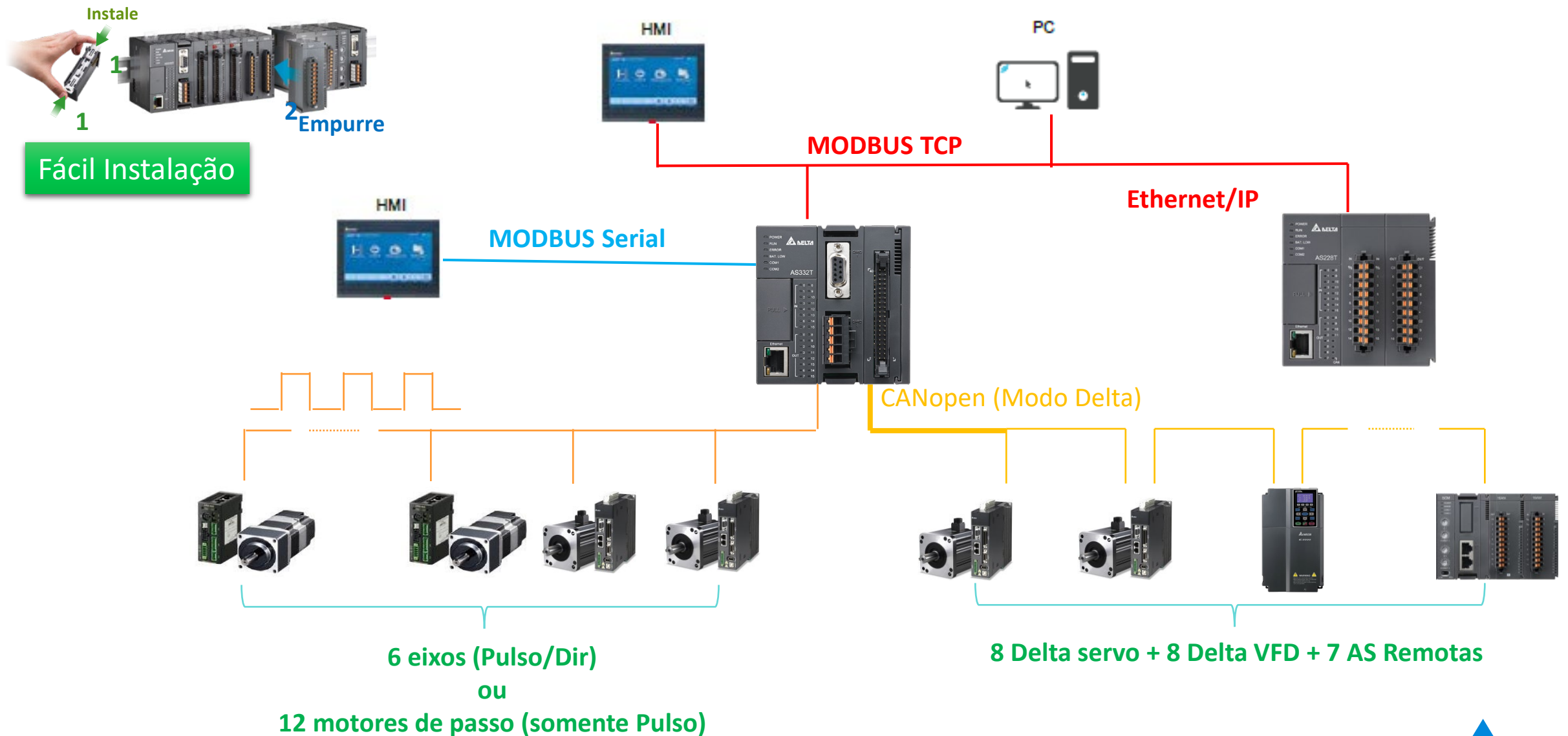
Série DVP V3

Plataforma DIAStudio



Linha AS

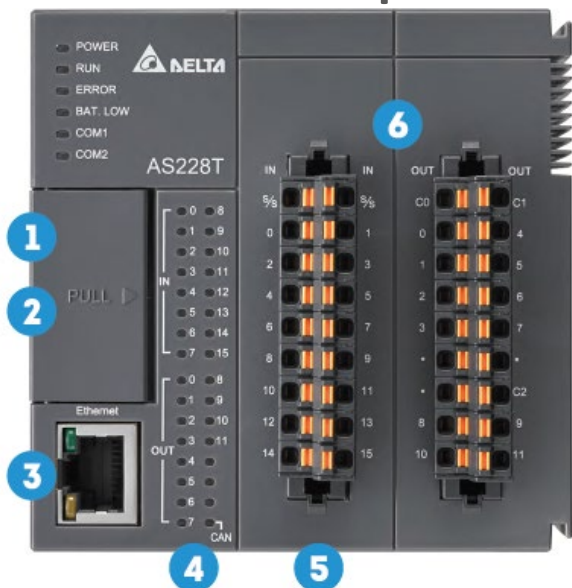
Arquitetura AS Overview



CLP Delta de Alta Performance – Família AS

AS200

64K steps $\approx \pm 256\text{Kbytes}$



6 I/O Incorporado

16DI / 12DO

Entradas Rápidas

4x 200kHz

Saídas Rápidas

6x 200Khz

1 Porta USB

2 Cartão Micro SD

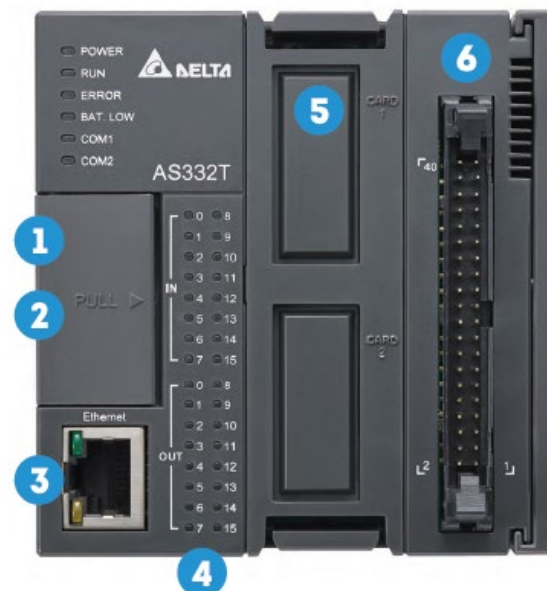
3 Ethernet

4 2x RS485

5 CanOpen incorporado

AS300

128K steps $\approx \pm 512\text{Kbytes}$



6 I/O Incorporado*

16DI / 16DO

Entradas Rápidas

6x 200kHz

Saídas Rápidas

6x 200KHz**

*Borne Vendido

Separadamente

**CPU AS324MT com

4MHz

1 Porta USB

2 Cartão Micro SD

3 Ethernet

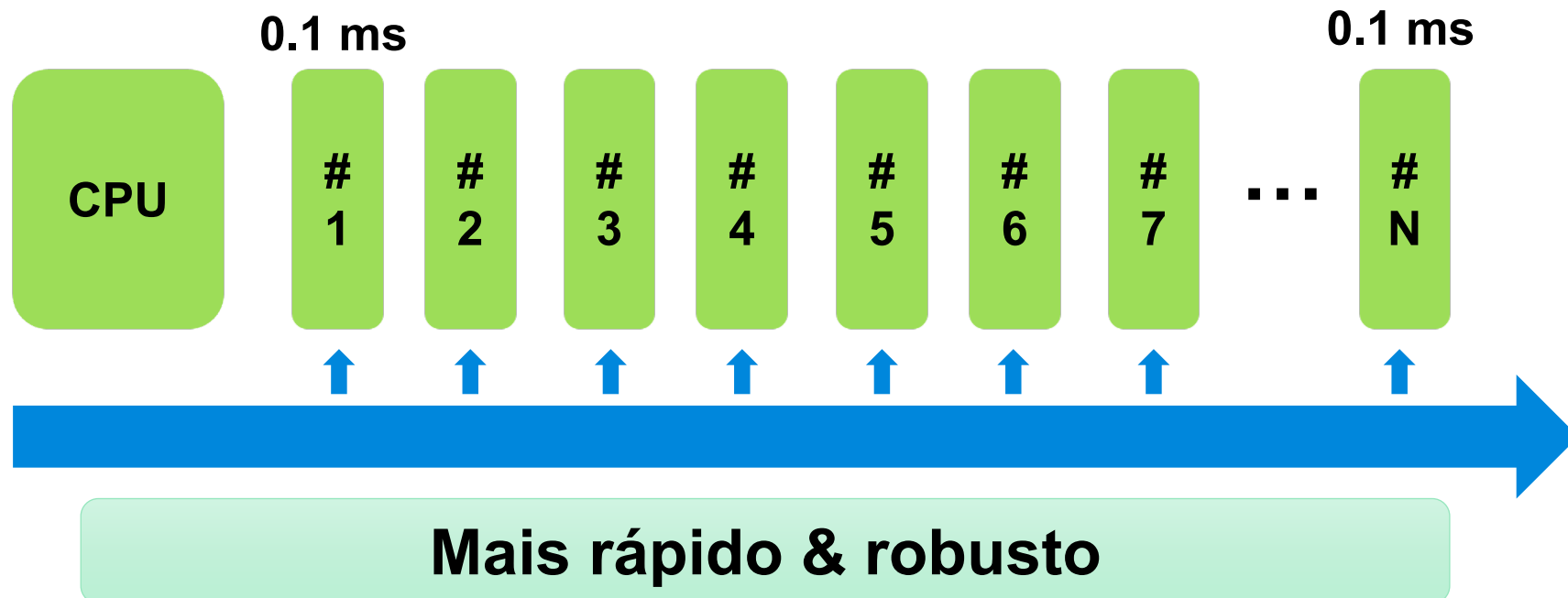
4 2x RS485

5 Slot Cartão de Expansão 2x

Serial / CanOpen / Analógicas

Barramento com protocolo industrial

32 Módulos



Módulos SCM – Remota CanOpen

I/O Remoto



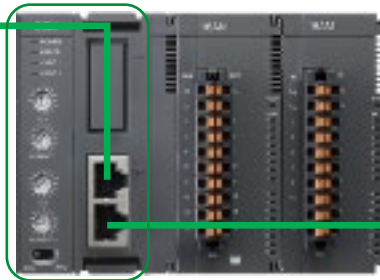
Vel. Máxima: 1Mbps

CANopen

Max. 15 Escravos
ou 32 módulos
(64 AIO ou 1,024 DIO)

Escravo Inteligente

AS00SCM-A
AS-FCOPM



■ Digital Output Modules

			
32 outputs	16 outputs	16 outputs	16 outputs
High-density MIL terminal block	Easy wiring terminal block	Easy wiring terminal block	Easy wiring terminal block
Transistor output	Transistor output	Transistor output	Relay output
NPN (Sink)	NPN (Sink)	NPN (Sink)	
AS32AN02T-A	AS16AN01T-A	AS16AN01T-B	AS16AN01R-A

			NPN (Sink) or PNP (Source) module
16 outputs	16 outputs	64 outputs	
Easy wiring terminal block	Easy wiring terminal block	High-density MIL terminal block	
Transistor output	Transistor output	Transistor output	Response time 1ms (Transistor) 10ms (Relay)
PNP (Source)	PNP (Source)	NPN (Sink)	Screwless removable terminal block 8 / 16 outputs
AS16AN01P-B	AS16AN01P-A	AS64AN02T-A	

■ Digital I/O Modules

			NPN (Sink) or PNP (Source) module
16 inputs / outputs	16 inputs / outputs	16 inputs / outputs	
Easy wiring terminal block	Easy wiring terminal block	Easy wiring terminal block	Rated input voltage 5 ~ 24V _{DC}
8 inputs / 8 transistor outputs	8 inputs / 8 relay outputs	8 inputs / 8 outputs	Filter function 1 ~ 20ms
NPN (Sink)		PNP (Source)	Response time 1ms (Transistor) 10ms (Relay)
AS16AP11T-A	AS16AP11R-A	AS16AP11P-A	Screwless removable terminal block

■ Analog I/O Modules

					
2 channels	4 channels	8 channels	8 channels	4 channels	6 channels
Analog input	Analog input	Analog input	Analog input	Analog output	Analog input/output
AS02ADH-A	AS04AD-A	AS08AD-B	AS08AD-C	AS04DA-A	AS06XA-A

Conversion time 20μs/channel	Conversion time 2ms/channel	50/60Hz filter	A: Voltage and current B: Voltage C: Current	Resolution AI: 16-bit AO: 12-bit
Accuracy ±0.2%	Accuracy ±0.2%	4/6/8 CHs	Module monitoring/configuration	Differential inputs

■ Load Cell Module ■ Pulse Unit Modules

			
2 channels	2 channels	4 channels	2 channels
AS02LC-A	Differential AS02PU-A	Open Collector AS04PU-A	Open collector / Diff AS02HC-A

Functions		
50/60Hz filter	High-speed dynamic measurement	
2 channels of independent sampling	Accuracy 0.04% of full-scale	
2 CHs	Connectable to 4-wire/5-wire load cell sensor	
Software		
Filter function	Multi-point calibration	
Online monitoring / configuration		

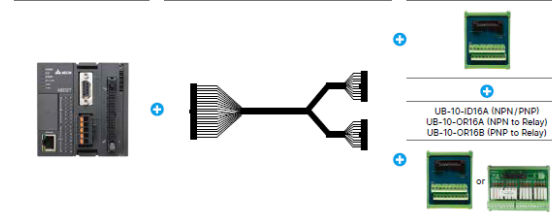
Input: AS02PU 200kHz	Output: AS02PU 200kHz AS04PU 100kHz
Open Collector / Diff	2/4 CHs
Support Motion APIs	

200 kHz	Incremental / Absolute (SSI)
Open Collector / Diff	2 CHs
Compare / Capture	

■ High Speed Counter Module

Módulos e Acessórios

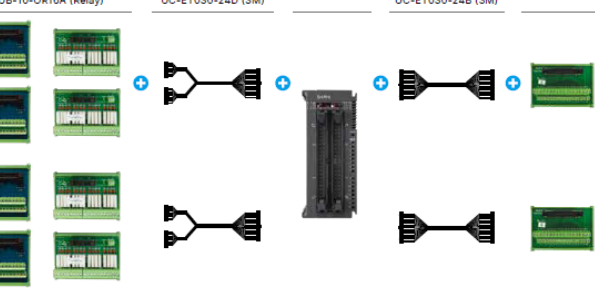
Model Name	
AS332T-A	UC-ET010-24D (1M)
AS332P-A	UC-ET020-24D (2M)
AS324MT-A	UC-ET030-24D (3M)



Model Name	
UB-10-ID16A	UC-ET010-24D (1M) UC-ET020-24D (2M) UC-ET030-24D (3M)
AS32AM10N-A	UC-ET010-24B (1M) UC-ET020-24B (2M) UC-ET030-24B (3M)
UB-10-ID32A	



Model Name	
UB-10-ID16A or UB-10-OR16A (Relay)	UC-ET010-24D (1M) UC-ET020-24D (2M) UC-ET030-24D (3M)
AS64AN02T-A	UC-ET010-24B (1M) UC-ET020-24B (2M) UC-ET030-24B (3M)
UB-10-OT32A	



■ Communication Modules / Remote I/O Modules

		
2 COM ports	DeviceNet	IO-Link
AS00SCM-A	AS01DNET-A	AS04SIL-A

■ Function Cards

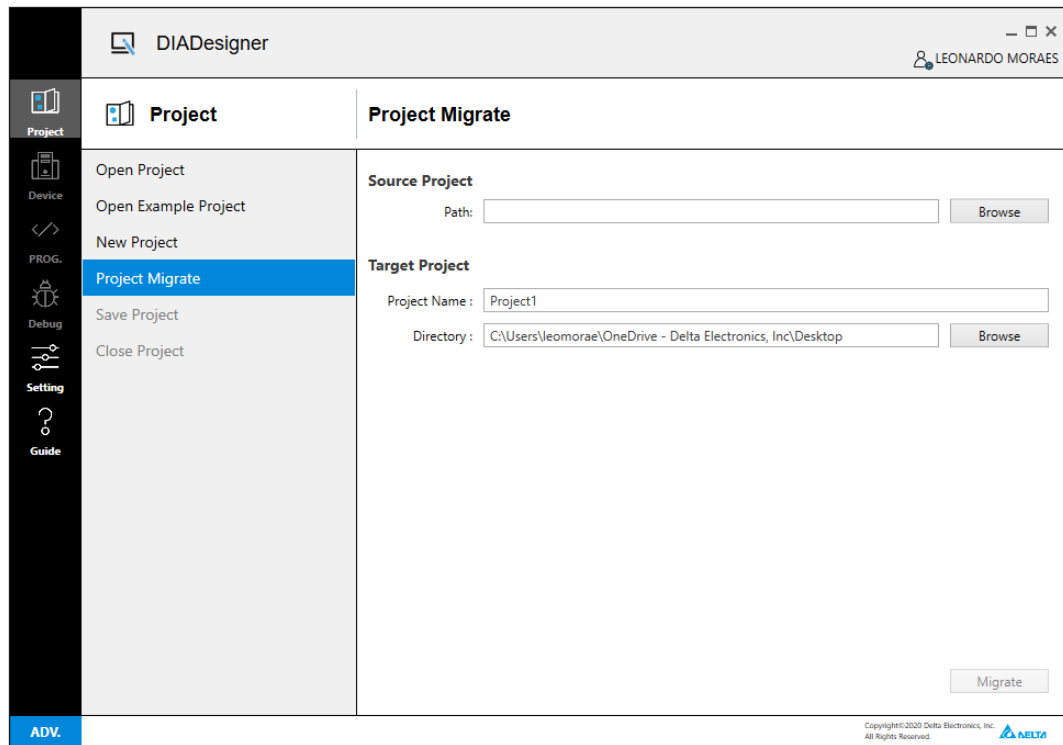
Name	Model	Channel	Specifications
Communication Card	AS-F232	1	Serial COM, RS-232 interface, slave/host mode
	AS-F422	1	Serial COM, RS-422 interface, slave/host mode
	AS-F485	1	Serial COM, RS-485 interface, slave/host mode
	AS-FCOPM	1	• CANopen port, supports DS301, AS Series remote control or Delta servo motor control • Built-in switchable terminal resistor (120Ω)
	AS-FEN02	1	Ethernet port, RJ45 x2 (Switch function), supports EtherNet/IP (Adapter mode) / Modbus TCP
	AS-FPFN02	1	PROFINET port, RJ45 x2 (Switch function), supports PROFINET (Device mode)
	AS-FOPC02	1	Ethernet port, RJ45 x2 (Switch function), supports OPC-UA (Server mode) / Modbus TCP
	AS-FFTP01	1	Ethernet port, RJ45 x1, supports high security OPC-UA (Server mode) / FTP Server / MQTT Client / Web Server (Node-RED) / Modbus TCP
	AS-FECAT	2	EtherCAT/Ethernet port, RJ45 x2, configurable as one EtherCAT master and another Modbus TCP server. EtherCAT master supports up to 16 axes point-to-point positioning with Delta drives
	AS-F2AD	2	2-channel analog input 0 ~ 10V (12-bit resolution), 4 ~ 20 mA (11-bit resolution), conversion time: 3ms/channel
Analog I/O Card	AS-F2DA	2	2-channel analog Output 0 ~ 10V, 4 ~ 20 mA (12-bit resolution), conversion time: 2 ms/channel

PROJECT MIGRATE

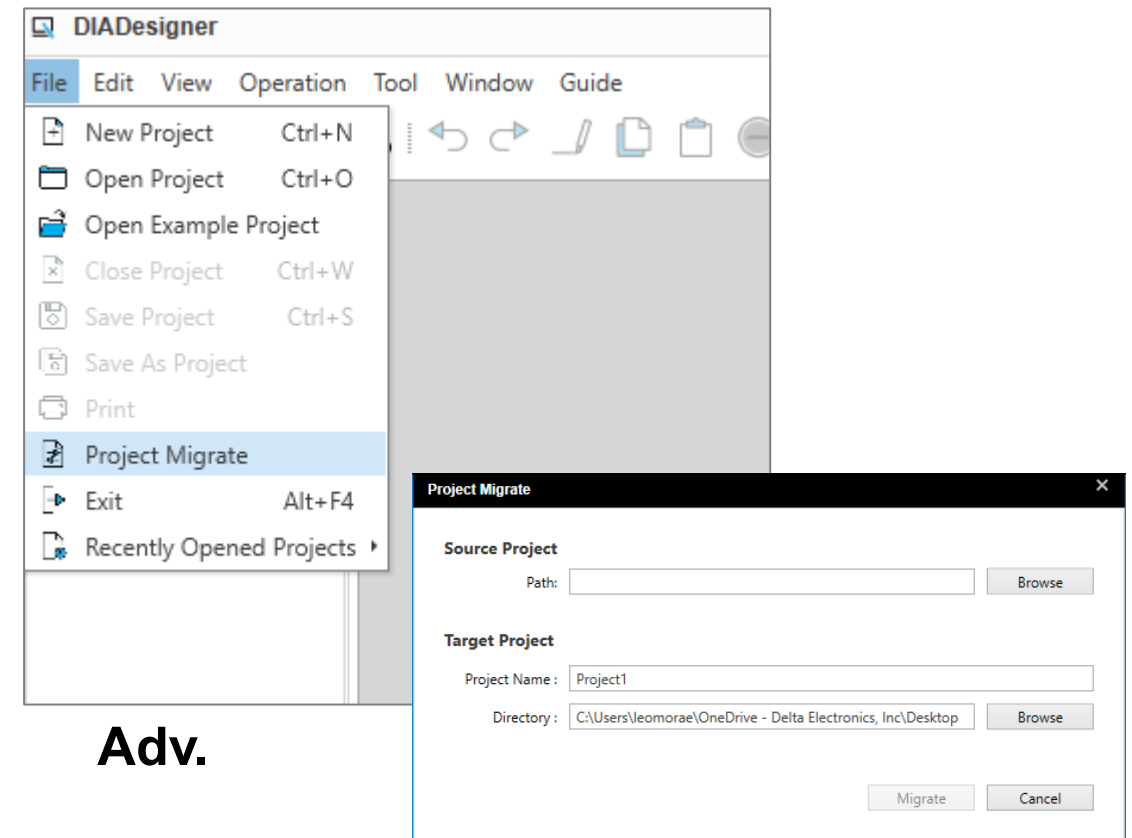
ISPSOft para DIADesigner

PROJECT MIGRATE

Projetos desenvolvidos no ISPSOft podem ser migrados facilmente para o DIADesigner.



Basic



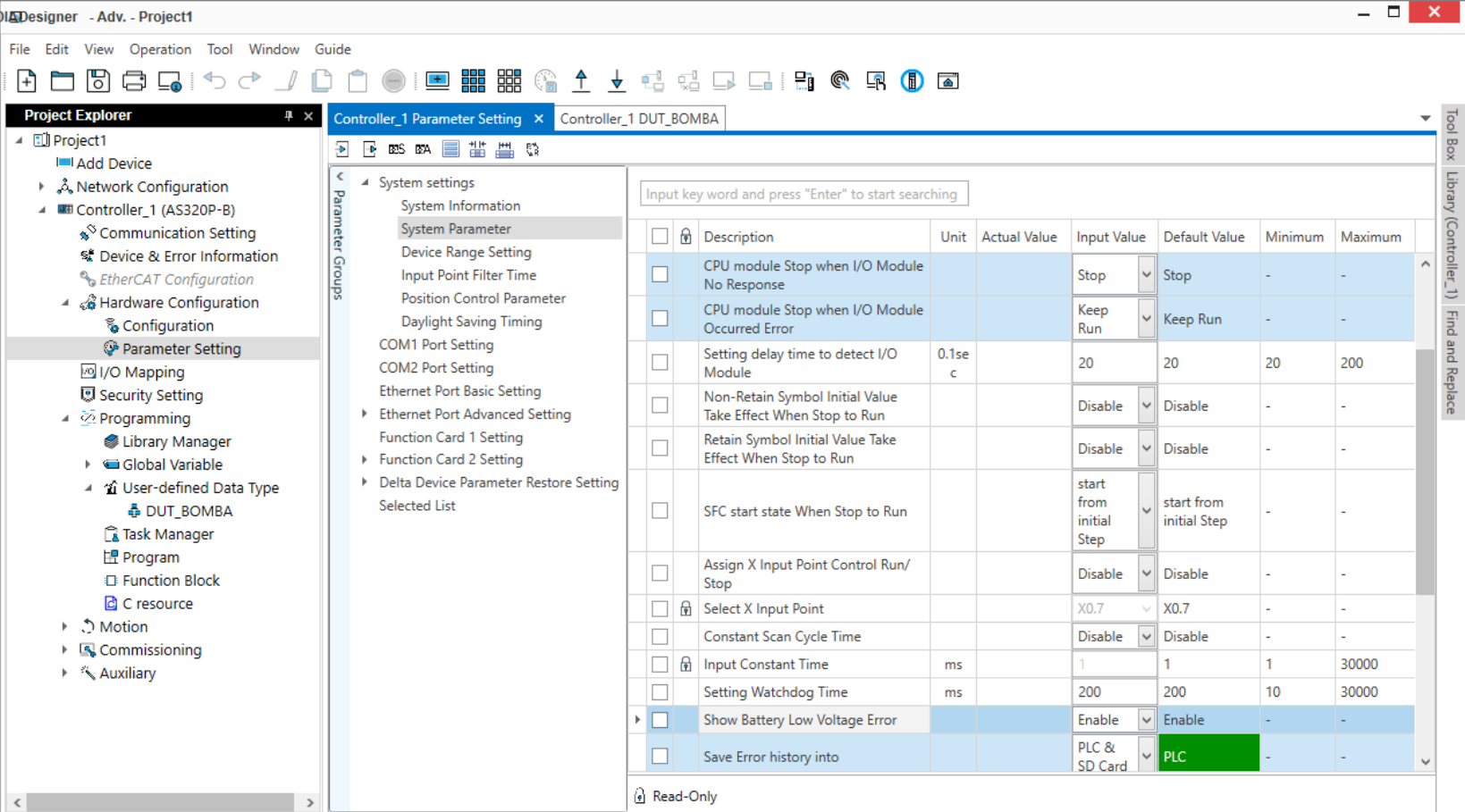
Adv.

SYSTEM SETTINGS

Parâmetros de Sistema

Parâmetros de configuração do comportamento da CPU, como por exemplo:

- CPU em Stop em caso de falha ou erro nos módulos de I/O
- Led de Bateria
- Histórico de Falhas da CPU salvo no SD Card
- Watchdog



The screenshot shows the 'Controller_1 Parameter Setting' window in the Delta Designer software. The 'System Parameter' tab is selected, displaying a list of system settings. The 'Show Battery Low Voltage Error' parameter is highlighted in blue, and the 'Save Error history into' parameter is highlighted in green.

	Description	Unit	Actual Value	Input Value	Default Value	Minimum	Maximum
☐	CPU module Stop when I/O Module No Response			Stop	Stop	-	-
☐	CPU module Stop when I/O Module Occurred Error			Keep Run	Keep Run	-	-
☐	Setting delay time to detect I/O Module	0.1sec		20	20	20	200
☐	Non-Retain Symbol Initial Value Take Effect When Stop to Run			Disable	Disable	-	-
☐	Retain Symbol Initial Value Take Effect When Stop to Run			Disable	Disable	-	-
☐	SFC start state When Stop to Run			start from initial Step	start from initial Step	-	-
☐	Assign X Input Point Control Run/Stop			Disable	Disable	-	-
☐	Select X Input Point			X0.7	X0.7	-	-
☐	Constant Scan Cycle Time			Disable	Disable	-	-
☐	Input Constant Time	ms		1	1	1	30000
☐	Setting Watchdog Time	ms		200	200	10	30000
☒	Show Battery Low Voltage Error			Enable	Enable	-	-
☐	Save Error history into			PLC & SD Card	PLC	-	-

Read-Only

Basic --- / 131.040 steps (0%) | Offline | AS320P-B | Copyright © 2020 Delta Electronics, Inc. All Rights Reserved.

Memórias Retentivas

Configuração do range de memórias retentivas

DIADesigner - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Project1
 - Add Device
 - Network Configuration
 - Controller_1 (AS320P-B)
 - Communication Setting
 - Device & Error Information
 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Motion
 - Commissioning
 - Auxiliary

Controller_1 Parameter Setting

System settings

- System Information
- System Parameter
- Device Range Setting
- Input Point Filter Time
- Position Control Parameter
- Daylight Saving Timing
- COM1 Port Setting
- COM2 Port Setting
- Ethernet Port Basic Setting
- Ethernet Port Advanced Setting
- Function Card 1 Setting
- Function Card 2 Setting
- Delta Device Parameter Restore Setting
- Selected List

Parameter Groups

Input key word and press "Enter" to start searching

☐	Description	Unit	Actual Value	Input Value	Default Value	Minimum	Maximum
☐	Latched D Device Start Address			20000	20000	0	29999
☐	Latched D Device End Address			23999	23999	0	29999
☐	Latched 16bit C Device Start Address			448	448	0	511
☐	Latched 16bit C Device End Address			511	511	0	511
☐	Latched 32bit HC Device Start Address			128	128	0	255
☐	Latched 32bit HC Device End Address			255	255	0	255
☐	Latched M Device Start Address			6000	6000	0	8191
☐	Latched M Device End Address			8191	8191	0	8191
☐	Latched S Device Start Address			512	512	0	2047
☐	Latched S Device End Address			1023	1023	0	2047
☐	Subroutine T Device Start Address			412	412	0	511
☐	Subroutine T Device End Address			511	511	0	511
☐	Communication Read-Only M Device			Disable	Disable	-	-
☐	Communication Read-Only M Device Start Address			6000	6000	0	8191
☐	Communication Read-Only M Device End Address			8191	8191	0	8191

Read-Only

Error List Search Results Find All Reference Device Update Report

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Filtro das Entradas Digitais

Configuração do filtro de tempo para as entradas digitais da CPU

IA Designer - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Project1
 - Add Device
 - Network Configuration
 - Controller_1 (AS320P-B)
 - Communication Setting
 - Device & Error Information
 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type
 - DUT_BOMBA
 - Task Manager
 - Program
 - Function Block
 - C resource
 - Motion
 - Commissioning
 - Auxiliary

Controller_1 Parameter Setting

Controller_1 DUT_BOMBA

Parameter Groups

- System settings
 - System Information
 - System Parameter
 - Device Range Setting
 - Input Point Filter Time
 - Position Control Parameter
 - Daylight Saving Timing
- COM1 Port Setting
- COM2 Port Setting
- Ethernet Port Basic Setting
- Ethernet Port Advanced Setting
- Function Card 1 Setting
- Function Card 2 Setting
- Delta Device Parameter Restore Setting
- Selected List

Input key word and press "Enter" to start searching

☐	Description	Unit	Actual Value	Input Value	Default Value	Minimum	Maximum
☐	X Input Point Setting Mode			Default Setting	Default Setting	-	-
☐	X0.0 Input Filter Time Setting	us		1	1	0	20000
☐	X0.1 Input Filter Time Setting	us		1	1	0	20000
☐	X0.2 Input Filter Time Setting	us		1	1	0	20000
☐	X0.3 Input Filter Time Setting	us		1	1	0	20000
☐	X0.4 Input Filter Time Setting	us		1	1	0	20000
☐	X0.5 Input Filter Time Setting	us		1	1	0	20000
☐	X0.6 Input Filter Time Setting	us		1	1	0	20000
☐	X0.7 Input Filter Time Setting	us		1	1	0	20000

Read-Only

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Configuração das Portas COM

Configuração do protocolo de comunicação das portas seriais COM

Designer - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Project1
 - Add Device
 - Network Configuration
 - Controller_1 (AS320P-B)
 - Communication Setting
 - Device & Error Information
 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type
 - DUT_BOMBA
 - Task Manager
 - Program
 - Function Block
 - C resource
 - Motion
 - Commissioning
 - Auxiliary

Controller_1 Parameter Setting

Controller_1 DUT_BOMBA

Parameter Groups

- System settings
 - System Information
 - System Parameter
 - Device Range Setting
 - Input Point Filter Time
 - Position Control Parameter
 - Daylight Saving Timing
 - COM1 Port Setting
 - COM2 Port Setting
 - Ethernet Port Basic Setting
 - Ethernet Port Advanced Setting
 - Function Card 1 Setting
 - Function Card 2 Setting
 - Delta Device Parameter Restore Setting
 - Selected List

Input key word and press "Enter" to start searching

☐	Description	Unit	Actual Value	Input Value	Default Value	Minimum	Maximum
☐	COM1 ID No.			1	1	1	254
☐	Protocol Setup Opportunity			Stop to Run	Stop to Run	-	-
☐	Baud Rate	bps		9600	9600	-	-
☐	Custom Baud Rate	0.1kbp s		96	96	1	5000
☐	Data bit	bit		7	7	-	-
☐	Parity bit			Even	Even	-	-
☐	Stop bit	bit		1	1	-	-
☐	MODBUS mode			ASCII	ASCII	-	-
☐	Delay time to sending	ms		0	0	0	3000
☐	Received Data Timeout	ms		200	200	0	3000
☐	Setting COM1 LED to show for			COM1	COM1	-	-

Read-Only

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Configuração da Porta Ethernet

Configuração Básica da Porta Ethernet da CPU

Designer - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Project1
 - Add Device
 - Network Configuration
 - Controller_1 (AS320P-B)
 - Communication Setting
 - Device & Error Information
 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type
 - DUT_BOMBA
 - Task Manager
 - Program
 - Function Block
 - C resource
 - Motion
 - Commissioning
 - Auxiliary

Controller_1 Parameter Setting

Controller_1 DUT_BOMBA

Parameter Groups

- System settings
 - System Information
 - System Parameter
 - Device Range Setting
 - Input Point Filter Time
 - Position Control Parameter
 - Daylight Saving Timing
 - COM1 Port Setting
 - COM2 Port Setting
 - Ethernet Port Basic Setting
 - Ethernet Port Advanced Setting
 - Function Card 1 Setting
 - Function Card 2 Setting
 - Delta Device Parameter Restore Setting
 - Selected List

Input key word and press "Enter" to start searching

☐	Description	Unit	Actua...	Input Value	Default Value	Minimum	Maximum
☐	IP Address			192.168.1.5	192.168.1.5	1.1.1.1	223.255.255.255
☐	Subnet Mask			255.255.255.0	255.255.255.0	128.0.0.0	255.255.255.254
☐	Gateway			192.168.1.1	192.168.1.1	1.1.1.1	223.255.255.255
☐	TCP Keep Alive Timeout	sec		30	30	1	65535
☐	Mode			Static	Static	-	-

Read-Only

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Configuração dos Cartões de Função

Cada modelo de Cartão de Função disponível o AS300 permite uma configuração específica.

Delta Designer - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Project1
 - Add Device
 - Network Configuration
 - Controller_1 (AS320P-B)
 - Communication Setting
 - Device & Error Information
 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type
 - DUT_BOMBA
 - Task Manager
 - Program
 - Function Block
 - C resource
 - Motion
 - Commissioning
 - Auxiliary

Controller_1 Parameter Setting x Controller_1 DUT_BOMBA

Parameter Groups

- System settings
 - System Information
 - System Parameter
 - Device Range Setting
 - Input Point Filter Time
 - Position Control Parameter
 - Daylight Saving Timing
 - COM1 Port Setting
 - COM2 Port Setting
 - Ethernet Port Basic Setting
 - Ethernet Port Advanced Setting
 - IP Filter
 - NTP
 - Email
 - Socket
 - RTU-EN01 Mapping
 - Function Card 1 Setting
 - Function Card 2 Setting
 - Ethernet Port Basic Setting
 - Ethernet Port IP Filter
 - Email(TLS)
 - Delta Device Parameter Restore Setting
 - Selected List

Input key word and press "Enter" to start searching

	Description	Unit	Actua...	Input Value	Default Value	Minimum	Maximum
☐	Card 2 Detect mode			Auto Detect	Auto Detect	-	-
☐	Manual Select Card			None	None	-	-
☐	Card 2 ID No.			1	1	1	254
☐	Protocol Setup Opportunity			Stop to Run	Stop to Run	-	-
☐	Baud Rate	bps		9600	9600	-	-
☐	Data bit	bit		7	7	-	-
☐	Parity bit			Even	Even	-	-
☐	Stop bit	bit		1	1	-	-
☐	MODBUS mode			ASCII	ASCII	-	-
☐	Delay time to sending	ms		0	0	0	3000
☐	Received Data Timeout	ms		200	200	0	3000
☐	F2AD Analog Input mode			0~10V	0~10V	-	-
☐	F2DA Analog Output mode			0~10V	0~10V	-	-
☐	F2AD Sampling Time	ms		3	3	3	15
☐	F2AD Average Times			10	10	1	15
☐	F2AD Analog Input Warning			Disable	Disable	-	-
☐	AS Remote			AS Remote	AS Remote	-	-

Read-Only

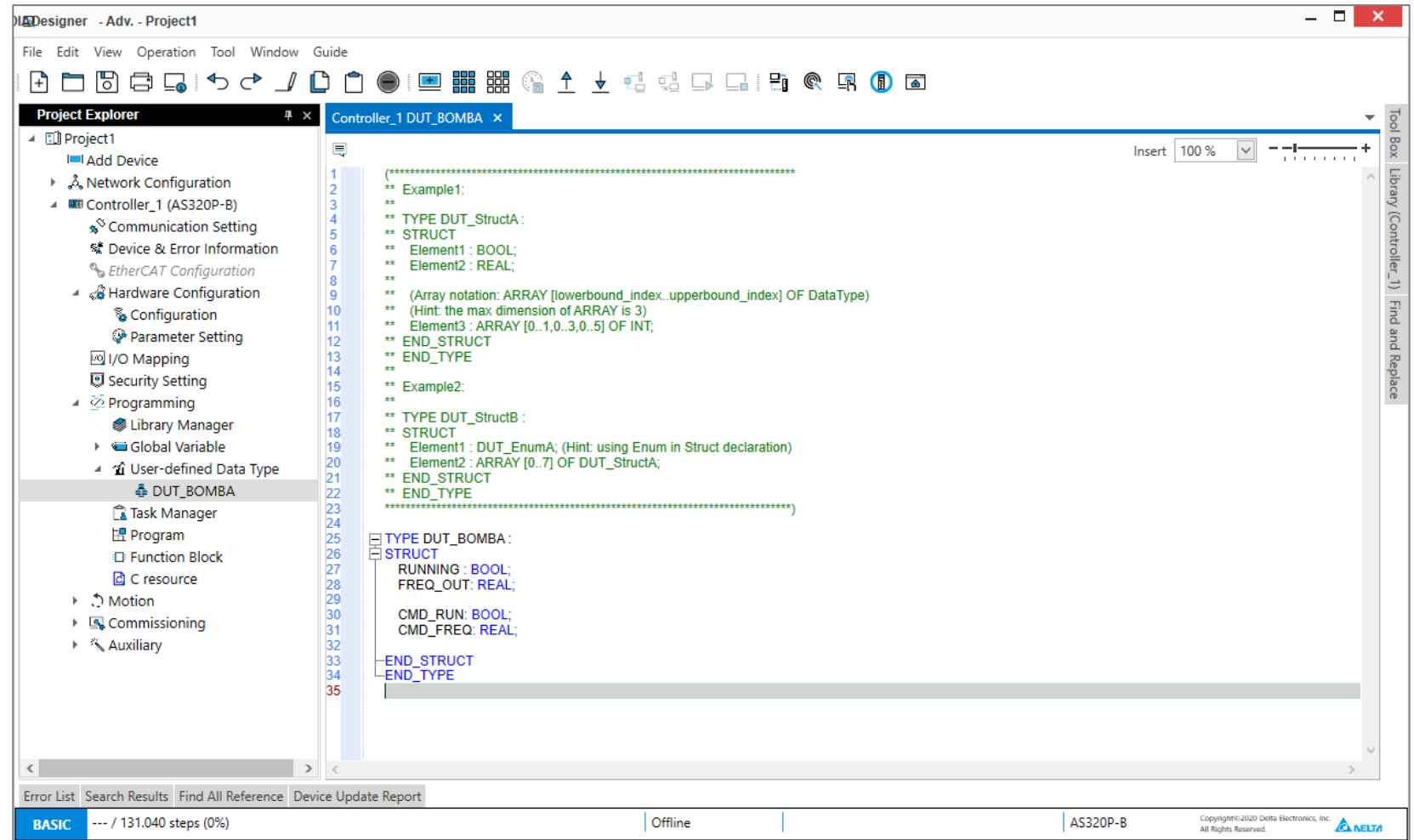
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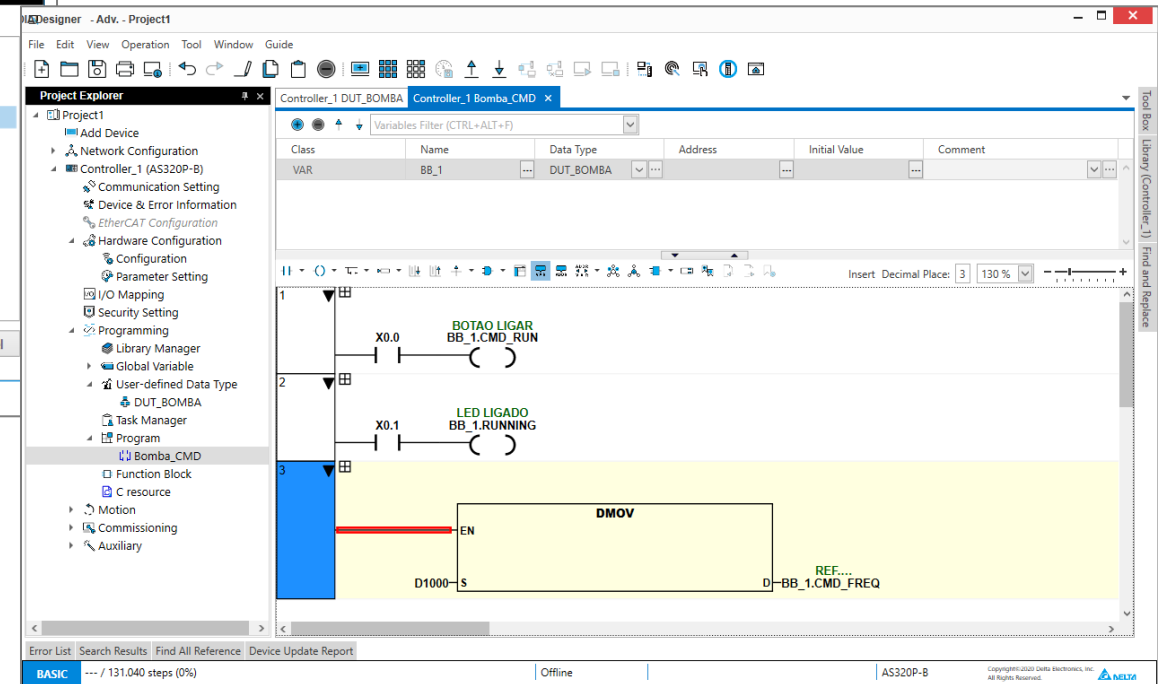
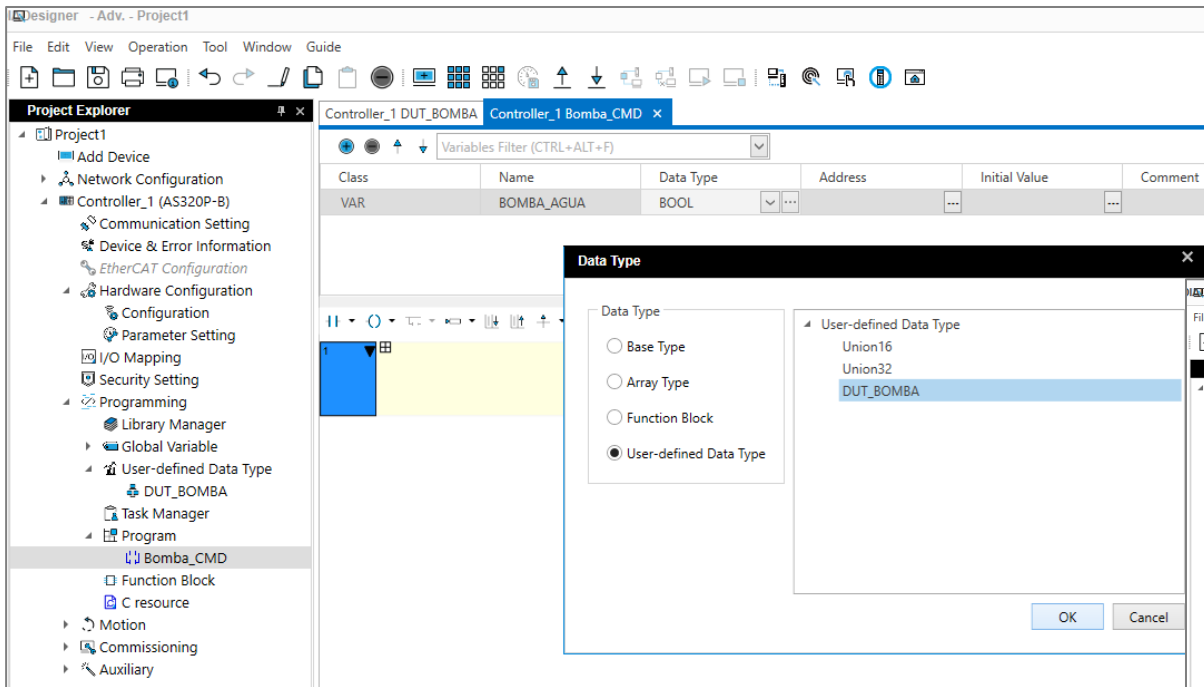
UDT

User Defined Data-Type

O DUT permite criar estruturas de variáveis e equipamentos.



User Defined Data-Type



FUNCTION BLOCK

Criando Function Block

Designer - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Project1
 - Add Device
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 - Controller_1 (AS320P-B)
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 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type
 - DUT_BOMBA
 - Task Manager
 - Program
 - Bomba_CMD
 - Function Block
 - FB_CMD
 - C resource
 - Motion
 - Commissioning
 - Auxiliary

Controller_1 DUT_BOMBA Controller_1 FB_CMD

Variables Filter (CTRL+ALT+F)

Class	Name	Data Type	Address	Initial Value	Comment
VAR_INPUT	CMD_LIGAR	BOOL			
VAR_INPUT	CMD_RESET	BOOL			
VAR_OUTPUT	OUT_CMD_LIGAR_OK	BOOL			
VAR_OUTPUT	OUT_ALARME	BOOL			

1

Comments ALARME Comments OUT_ALARME

2

Comments CMD_LIGAR Comments ALARME Comments OUT_CMD_LIGA...

3

Comments CMD_RESET Comments OUT_ALARME

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Utilizando Function Blocks com UDTs

Designer - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Project1
 - Add Device
 - Network Configuration
 - Controller_1 (AS320P-B)
 - Communication Setting
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 - EtherCAT Configuration
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 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type
 - DUT_BOMBA
 - Task Manager
 - Program
 - Bomba_CMD
 - Function Block
 - FB_CMD
 - C resource
 - Motion
 - Commissioning
 - Auxiliary

Controller_1 DUT_BOMBA Controller_1 FB_CMD Controller_1 Bomba_CMD

Variables Filter (CTRL+ALT+F)

Class	Name	Data Type	Address	Initial Value	Comment
VAR	BB_1	DUT_BOMBA			
VAR	FB_1	FB_CMD			

Insert Decimal Place: 3 100 %

1

FB_1

FB_CMD

EN

ENO

X0.0 CMD_LIGAR

OUT_CMD_LIGAR_OK

BOTAO LIGAR

BB_1.CMD_RUN

X0.1 CMD_RESET

OUT_ALARME

Y0.0

X0.2 ALARME

2

EN

DMOV

D1000 S

D BB_1.CMD_FREQ

REF....

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TIMER E COUNTER NO FB

Utilizando Timers e Contadores no Function Block

The image displays two screenshots of the Delta Designer software interface, illustrating the configuration and use of function blocks for timers and counters.

Left Screenshot: Shows the 'Controller_1 DUT_BOMBA' configuration window. The 'Project Explorer' on the left lists the project structure, including 'Controller_1 (AS320P-B)' and its sub-components. The main area displays a table of variables and their data types:

Class	Name	Data Type	Address
VAR_INPUT	CMD_LIGAR	BOOL	
VAR_INPUT	CMD_RESET	BOOL	
VAR_OUTPUT	OUT_CMD_LIGAR_OK	BOOL	
VAR_OUTPUT	OUT_ALARME	BOOL	
VAR_INPUT	ALARME	BOOL	
VAR_IN_OUT	TEMPO_ON	T_POINTER	

Below the table, a ladder logic diagram is shown, featuring a timer block (TMR) and a counter block (DMOV) connected to the variables defined in the table.

Right Screenshot: Shows the 'Controller_1 Bomba_CMD' configuration window. The 'Project Explorer' on the left lists the project structure, including 'Controller_1 (AS320P-B)' and its sub-components. The main area displays a table of variables and their data types:

Class	Name	Data Type	Address	Initial Value	Comment
VAR	BB_1	DUT_BOMBA			
VAR	FB_1	FB_CMD			

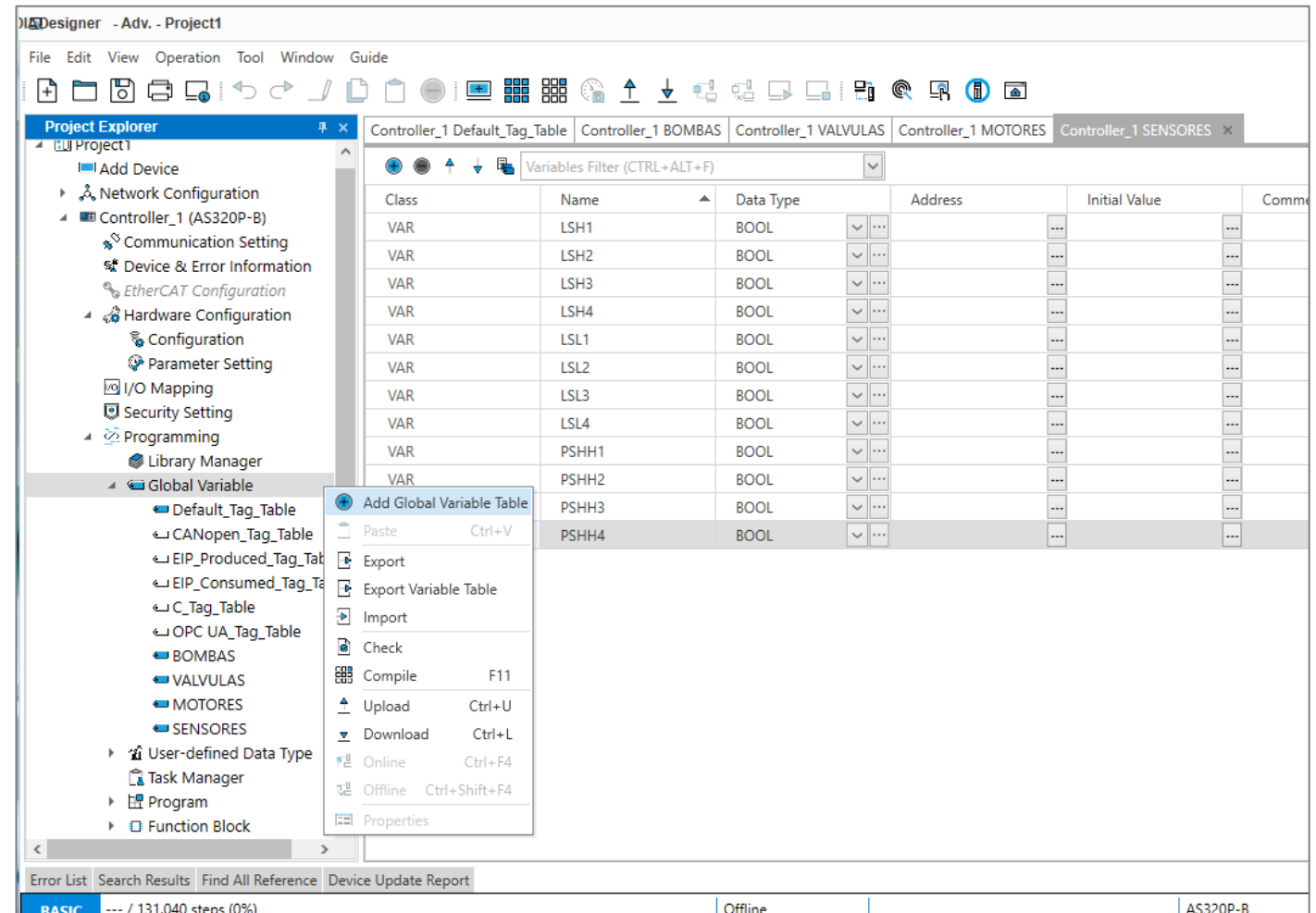
Below the table, a ladder logic diagram is shown, featuring a function block (FB_CMD) and a counter block (DMOV) connected to the variables defined in the table.

GVL

Variáveis Globais

O uso de GVLs permitem que as variáveis sejam acessíveis de qualquer parte do programa e o programa possa ser melhor estruturado e organizado, algo fundamental em grandes aplicações

OBS.: As variáveis disponíveis nas GVLs permitem integração direta com as IHMs DOP100, via DIA Tag.



LINGUAGEM ST - Structured Text

Structured Text

A linguagem ST permite desenvolver logicas mais complexas, principalmente quando cálculos matemáticos avançados.

The screenshot displays the Delta Designer software interface. The 'Project Explorer' on the left shows the project structure, including 'Controller_1 (AS320P-B)' and 'Programming'. The 'Add Program' dialog box is open, showing the 'Name' field set to 'Logica_ST' and the 'Language' dropdown set to 'ST (Structured Text)'. The main editor window shows the 'Controller_1 Logica_ST' editor with a table of variables and a code editor.

Class	Name	Data Type	Address	Initial Value
VAR	CMD_LIGAR	BOOL		...
VAR	ALARME	BOOL		...
VAR	RESET	BOOL		...
VAR	OUT_LIGADO	BOOL		...

```
1 IF NOT ALARME AND CMD_LIGAR THEN
2   OUT_LIGADO := 1;
3
4 ELSIF ALARME AND RESET THEN
5   ALARME := 0;
6
7 END_IF;
8
9
```

LINGUAGEM CFC

Continuous Function Chart

A linguagem CFC é também chamada de programação em Blocos.

The screenshot displays the Delta Designer software interface for Project1. The Project Explorer on the left shows the project structure, including Controller_1 (AS320P-B) and its various settings. The main workspace shows the Continuous Function Chart (CFC) programming environment.

Variables Filter (CTRL+ALT+F)

Class	Name	Data Type	Address	Initial Value	Comment
VAR	CMD_LIGAR	BOOL		...	
VAR	ALARME	BOOL		...	
VAR	RESET	BOOL		...	
VAR	OUT_LIGADO	BOOL		...	

The CFC diagram shows two AND logic blocks. The first block has inputs CMD_LIGAR and ALARME, and output OUT_LIGADO. The second block has inputs ALARME and RESET, and output ALARME.

Add Program Dialog

Name: Logica_CFC
Language: CFC (Continuous Function Chart)
Comment:

LINGUAGEM SEQUENTIAL CHART

Sequential Function Chart

A linguagem SFC é também chamada de programação Grafcet e muito utilizada em processos sequenciais, como o conceito de máquina de estados.

The screenshot displays the Delta Designer software interface for Project1. The Project Explorer on the left shows the project structure, including Controller_1 (AS320P-B) and its various configuration and programming options. The main workspace shows the Sequential Function Chart (SFC) programming environment.

Variables Filter Table:

Class	Name	Data Type	Address	Initial Value	Comment
VAR	TMR_BB1	BOOL	...	...	...
VAR	BOMBA2	STEP	...	...	...
VAR	TMR_BB2	BOOL	...	...	...

The SFC diagram shows a sequence of steps and actions. The steps are represented by rectangles with a vertical line on the left. The actions are represented by rectangles with a vertical line on the right. The diagram includes steps for BOMBA1, BOMBA2, and TMR_BB1, with associated actions like Action_1 and Action_2. The diagram is plotted on a grid with a time axis from -300 to 550.

COMUNICACAO MODBUS

Comunicação Modbus RTU – RS485

DIADesigner - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Project1
 - Add Device
 - Network Configuration
 - Network View
 - Connected Network
 - MODBUS_1(RS485)
 - Controller_1(AS320P-B)
 - Drive_1(VFD2A8MS23*)
 - Drive_2(VFD4A8MS21*)
 - Drive_3(VP3000)
 - Drive_4(VFD750C63*)
 - MODBUS_2(RS485)
 - Controller_1(AS320P-B)
 - Controller_2(DVP-SV3)
 - Controller_3(AS228T-A)
 - Disconnected Devices
 - Controller_1 (AS320P-B)
 - Communication Setting
 - Device & Error Information
 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type

Network View

COM1 : MODBUS COM2 : MODBUS

50 %

Legend: Ethernet (Red), Serial Port (Blue), CANopen (Green)

Diagram showing a network topology with three controllers (Controller_1, Controller_2, Controller_3) and four drives (Drive_1, Drive_2, Drive_3, Drive_4) connected via MODBUS_1 and MODBUS_2 networks.

Controller_1

General		Ports Information						
	COM PORT	Port Name	Rack ID	Card/Slot ID	Station ID	IP Address	Network Parameter	Network Line
EtherNet/IP	RS485	COM1	-	-	1	-	9600, 7, Even, 1	MODBUS_1
	RS485	COM2	-	-	1	-	9600, 7, Even, 1	MODBUS_2
	Ethernet	Ethernet	-	-	-	192.168.1.5	-	-

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Comunicação Modbus RTU – RS485

DIADesigner - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Network View
 - Connected Network
 - MODBUS_1(RS485)
 - Controller_1(AS320P-B)
 - Drive_1(VFD2A8MS23**)
 - Drive_2(VFD4A8MS21**)
 - Drive_3(VP3000)
 - Drive_4(VFD750C63*)
 - MODBUS_2(RS485)
 - Controller_1(AS320P-B)
 - Controller_2(DVP-SV3)
 - Controller_3(AS228T-A)
 - Disconnected Devices
 - Controller_1 (AS320P-B)
 - Communication Setting
 - Device & Error Information
 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type
 - Task Manager
 - Program
 - Function Block

Network View

Controller_1_MODBUS_Data Exchange Table

80 %

Legend: Ethernet (Red), Serial Port (Blue), CANopen (Green)

MODBUS_1

MODBUS_2

Start Mode: PLC Run

No.	Enable	Node ID	Slave Name	Master Register	<->	Slave Register	Length	Setting
1	☒	2	Drive_1	D0	←	16#0000	1	WORD
				D0	→	16#0000	1	WORD
2	☒	3	Drive_2	D0	←	16#0000	1	WORD
				D0	→	16#0000	1	WORD
3	☒	4	Drive_3	D0	←	16#0000	1	WORD
				D0	→	16#0000	1	WORD
4	☒	5	Drive_4	D0	←	16#0000	1	WORD

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Comunicação Modbus RTU – RS485

DIADesigner - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Network View
 - Connected Network
 - MODBUS_1(RS485)
 - Controller_1(AS320P-B)
 - Drive_1(VFD2A8MS23**)
 - Drive_2(VFD4A8MS21**)
 - Drive_3(VP3000)
 - Drive_4(VFD750C63*)
 - MODBUS_2(RS485)
 - Controller_1(AS320P-B)
 - Controller_2(DVP-SV3)
 - Controller_3(AS228T-A)
 - Disconnected Devices
 - Controller_1 (AS320P-B)
 - Communication Setting
 - Device & Error Information
 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type
 - Task Manager
 - Program
 - Function Block

Network View Controller_1_MODBUS_Data Exchange Table

80 %

Legend: Ethernet (Red), Serial Port (Blue), CANopen (Green)

Diagram showing three controllers (Controller 1, Controller 2, Controller 3) connected to a common MODBUS_2 network via Serial Port (Blue).

Start Mode: PLC Run

No.	Enable	Node ID	Slave Name	Master Register	<->	Slave Register	Length	Setting
1	☒	6	Controller_2	D0	←	T0	1	WORD
				D0	→	T0	1	WORD
2	☒	7	Controller_3	D0	←	X0	1	WORD
				D0	→	Y0	1	WORD

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Offline

AS320P-B

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COMUNICACAO ETHERNET/IP

Comunicação Ethernet/IP

DIADesigner - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Network View
 - Connected Network
 - MODBUS_1(RS485)
 - Controller_1(AS320P-B)
 - Drive_1(VFD2A8MS23**)
 - Drive_2(VFD4A8MS21**)
 - Drive_3(VP3000)
 - Drive_4(VFD750C63*)
 - MODBUS_2(RS485)
 - Controller_1(AS320P-B)
 - Controller_2(DVP-SV3)
 - Controller_3(AS228T-A)
 - Ethernet_1(Ethernet)
 - AS-FEN02 (AS RTU)_1(A)
 - Controller_1(AS320P-B)
 - Disconnected Devices
 - Controller_1 (AS320P-B)
 - Communication Setting
 - Device & Error Information
 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type

Network View

50 %

Legend: Ethernet (Red), Serial Port (Blue), CANopen (Green)

Diagram showing network connections between controllers (Controller_1, Controller_2, Controller_3) and drives (Drive_1, Drive_2, Drive_3, Drive_4) via MODBUS_1, MODBUS_2, and Ethernet_1 networks.

AS-FEN02 (AS RTU)_1 EtherNet/IP Version: 1.01

General		Ports Information						
	COM PORT	Port Name	Rack ID	Card/Slot ID	Station ID	IP Address	Network Parameter	Network Line
EtherNet/IP	Ethernet	Ethernet 1	-	-	-	192.168.1.3	i	Ethernet_1

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BASIC

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Comunicação Ethernet/IP

DIADesigner - Adv. - Project1

File Edit View Operation Tool Window Guide

Project Explorer

- Network View
 - Connected Network
 - MODBUS_1(RS485)
 - MODBUS_2(RS485)
 - Controller_1(AS320P-B)
 - Controller_2(DVP-SV3)
 - Controller_3(AS228T-A)
 - Ethernet_1(Ethernet)
 - Disconnected Devices
 - Controller_1 (AS320P-B)
 - Communication Setting
 - Device & Error Information
 - EtherCAT Configuration
 - Hardware Configuration
 - Configuration
 - Parameter Setting
 - I/O Mapping
 - Security Setting
 - Programming
 - Library Manager
 - Global Variable
 - User-defined Data Type
 - Task Manager
 - Program
 - Function Block
 - C resource
 - Motion
 - Commissioning
 - Auxiliary

Network View Controller_1_EtherNet/IP_Data Exchange Table

80 %

Legend: Ethernet (Red), Serial Port (Blue), CANopen (Green)

Diagram showing a network connection between a controller (AS320P-B) and a device (AS-FEN02 AS RT...).

No.	Enable	Tag	IP Address	Slave Name	Master Register/Vari...	<->	Slave Register/Param...	Length	Setting
1	☒	☐	192.168.1.3	AS-FEN02 (AS RT...	D0	←	Input	20	BYTE
					D0	→	Output	20	BYTE

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BASIC

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Smarter. Greener. Together.

