PROFIBUS-DP NET Interface   PO4053

Product Description

PO4053 is a PROFIBUS-DP master interface belonging to Ponto® PLC Series to be used with PO3242 and PO3342 CPUs.

The Photograph shows the product mounted over a PO6400 base which includes power supply connector and DB9 that attaches the module to PROFIBUS-DP fieldbus. PO4053 main characteristics are:

- PROFIBUS-DP master data communications protocol compatible with any PROFIBUS-DP slave equipment, according to EN 50170, IEC 61158 and IEC-61784 standarts.
- 3584 input bytes and 3584 output bytes data capacity
- Allows the implementation of redundant net architectures with PO5063V4 fieldbus head.
- Supports Hot-standby operation
- Configuration and parameterization through ProfTool AL-3865 software
- Local operation state and diagnostic through panel LEDs
- Supply network diagnostics to system CPU
- Baudrate up to 12 Mbits
- RS-232C interface avaiable to configure and supervise I/O points and local diagnostic
- Panel label to identify equipment
- Connection capacity of 126 slaves
- Compatible with AL-2431 and AL-2432 optical repeaters

Ordering Information

Packing List

The product packing contains the following parts:
- PO4053 Module
- Installation guide

Part Number

The following code must be used when ordering th product

Part Number	Description
PO4053	Interface de Rede PROFIBUS-DP

Related Products

The following products must be ordered separately when needed:

Part Number	Description
PO6400	Base Interface de Rede PROFIBUS
AL-2601	Conector derivador, para rede PROFIBUS
AL-2602	Conector terminador, para rede PROFIBUS
AL-2604	Conector PROFIBUS inteligente
AL-2303	Cabo de rede PROFIBUS, diâmetro 7,1 mm
AL-1715	Cabo RJ45-CFDB9
AL-3865	ProfiTool - Software Programador PROFIBUS
PO5063	Cabeça de rede de campo PROFIBUS-DP
PO5063V4	Cabeça de rede de campo PROFIBUS-DP Redundante
AL-2431	Repetidor ótico FOCUS/PROFIBUS
AL-2432	Repetidor ótico FOCUS/PROFIBUS com duas portas óticas
PO8510	10 Folhas de 14 etiquetas de 14 tags p/ impressora

Notes

PO6400: this base as a DB9 connector for attaching the PROFIBUS net and a RJ45 for configuration.

AL-2601: the PROFIBUS connectors a DB9 type with standard pin-out and no internal termination. It is appropriate to connect PROFIBUS devices in intermediate positions of PROFIBUS network, or physically not mounted in network extremes. This connector has input and output ports to net cable, allowing module replacement without interrupting the signal lines.

AL-2602: the PROFIBUS connectors a DB9 type with standard pin-out and assembled internal termination components. It is appropriate to connect PROFIBUS devices in extremes positions of PROFIBUS network (beginning or ending).

AL-2604: AL-2604 connector can be used to connect a module to the PROFIBUS network with termination switched on or off. Also it has LEDs for indication of network state and termination.

AL-2303: PROFIBUS net data communication cable.

AL-1715: This cable has a RJ45 connector on one and and a DB9 (RS-232) female IBM/PC standard connector on other end. It must be used to configure the interface through PC serial interface, using AL-3865 software - ProfiTool

AL-3865: ProfiTool software which allows assemble PO4053 interface PROFIBUS network configuration.

PO5063: the PROFIBUS fieldbus head allows the connection of PONTO modules to the net, expanding UCP I/O system.

PO5063V4: the PROFIBUS fieldbus redundant head allows the connection of PONTO modules in redundant net configuration.

AL-2431 e AL-2432: These optical repeaters are used to connect by optical fiber any PROFIBUS devices. Many netowrk topologies can be implemented with 3.000 meters range and more segments, increasing the number of devices in the net. AL-2432 has optical media redundancy, increasing system availability.

Characteristics

	PO4053
Module type	PROFIBUS-DP master interface
Communication Protocol	PROFIBUS-DP master, EN50170, IEC 61158 and IEC 61784 standards
Network architecture	Bus, without derivations
Communication Speed	9,6 to 12000 Kbit/s, configurable
Number of Nets	Maximum of 2 PROFIBUS nets per PO3242/PO3342 UCP, redundant or non redundant.
Number of modules PO4053	Maximum of 4 PO4053 per UCP PO3242/PO3342 UCP in 2 redundant networks configuration or 2 PO4053 whitout redundancy.
Diagnostic indication	1 LED for PONTO bus diagnostic indication; 4 LEDs for network diagnostic indication.
Hot standby	Yes
Power consumption	50 mA @ 5 Vdc
External voltage supply	19 to 30 Vdc ripple included max. consumption. 167 mA @ 24 Vdc
Isolation **Externa \l supply to logics** **PROFIBUS net to logics**	 1500 Vac @ 1 minute 500 Vdc @ 1 minute
Power dissipation	4,25 W @ 24 Vdc
Maximum operation temperature	60 $^{\circ}$C
Dimensions	99 x 49 x 81 mm
Configuration interface	RS232 in RJ45
Standards accomplished	EN 50170, IEC 61158 e IEC 61784 IEC 61131 standards See series general characteristics
Compatible bases	PO6400: PROFIBUS fieldbus interface base

Software Characteristics	
Communication	Through PROFIBUS-DP protocol
Configuration and programming	Through ProfiTool and MasterTool software's
Operand type accessed	A, E, S e M
Input capacity	3584 bytes
Output capacity	3584 bytes
Max. number of Relations	1536 relations
GSD file	Hil_1662.gsd

Notes

Relations: are associations between PLC operands and modules on the PROFIBUS net make by MasterTool. Each module on net generates one relation. Each net knot can have various modules.

GSD file: HIL_1662.GSD file is available with AL-3865 ProfiTool product and also is available for download in ALTUS site (www.altus.com.br).

Transfer Time

The operand transfer time depends on de 2 variables:

- PROFIBUS cycle time
  (depends on slave number and network speed – see MU99026 manual)
- Transfer time between interface and image memory in UCP

The following table shows how to calculate the time spent by CLP to transfer operands to a PO4053 PROFIBUS network. The time spent varies with operand type, operand number and relation number (relation is a byte association with CLP operands assembled by MasterTool). In case of redundant net the time spent must be doubled.

The calculated time must be added to PLC scan time forecast.

	Transfer Time
Operand transfer: %MXXXX	3,0 µs per byte
Operand transfer: %AXXX, %EXXX or %SXXX	2,3 µs per byte
Processing relation time with %MXXXX type operands	16 µs per relation (excluding byte transfer time)
Processing relation time with %AXXX, %EXXX or %SXXX type operands	18 µs per relation (excluding byte transfer time)
Processing time	1400 µs

Redundancy

The PO4053 module can be used in *pairs* in order to implement *redundant* nets. In redundant operation two PROFIBUS nets are used to connect redundant slaves (Ex: PO5063V4 heads) in such a way that slave data transfer is not affected by a failure of one of the nets.

Fieldbus redundancy is a important characteristic where great reliability, availability and dynamic expandability is needed. The PO4053 net interface is a solution for this kind of work, have been specially projected for this service type.

Control Capacity

The product capacity for attending such control architecture size must be analyzed in various aspects which involves the interface and the UCP where it is connected. These factors included and are not limited to:

- Number of I/O bytes admitted by PO4053
- Number of relations
- Operand capacity of CPU
- Application Program size
- Number of slaves knots
- Number of PO4053 interfaces used
- Redundancy if needed
- PROFIBUS network cycle time
- Application Program cycle time

As reference and follows an example of an application which comply with needed capacity and the involved times.

Application Example - Architecture

10 slaves typical configuration with 16 modules each:

	Qtt	**Relations**	**Total Bytes**
PO1000 16 ED	6	6	12
PO2022 16 SD	4	4	8
PO11112 8 EA	4	4	64
PO2132 16 AS	2	2	16
Total	**16**	**16**	**100**

Application Example –Processing forecast

PROFIBUS scan time for application example:

Transfer time	1400 µs	1400 µs
Transfer of 100 bytes for 10 modules	3 µs / byte x 100 bytes / slave x 10 modules =	3000 µs
Transfer of 16 relations to 10 modules	16 µs / relation x 16 relation s x 10 modules =	2560 µs
Total		6960 µs => 6,9 ms

Process execution time forecast for application example (high variable):

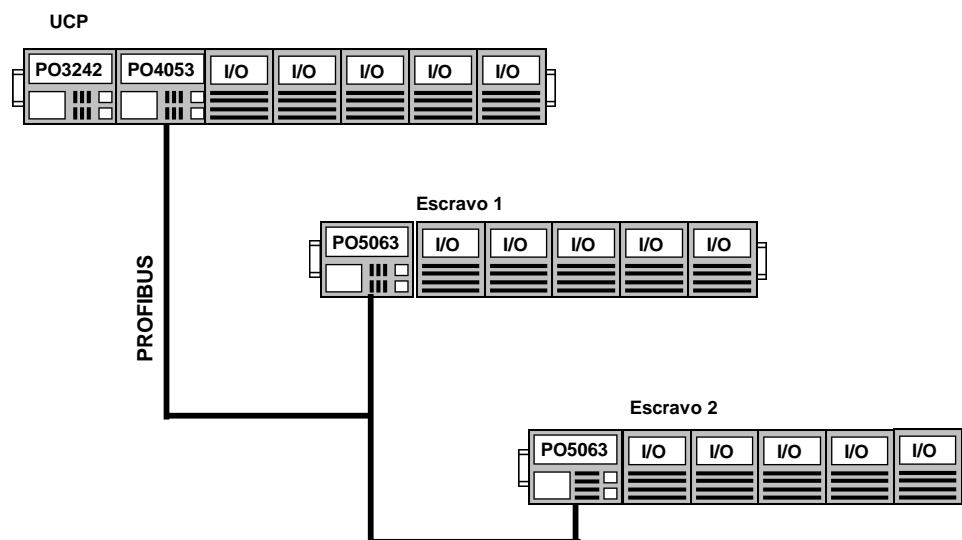|		
Forecast for digital points	1600 pontos x 4 contatos / ponto x 1,5 µs / contato	9600 µs
Forecast for analogic points	20 PID loops x 300 µs / loop	6000 µs
Continuous integer calculus: 100 calculus: (45 µs mean per integer calculus)	100 integer calculus x 45 µs / calculus	4500 µs
20 F module calls (230 µs mean per call)	20 calls x 230 µs / calls	4600 µs
Total		24700 µs => 24,7 ms

Data Analysis

The total estimated time for this architecture is 31,5 ms, controlling 180 digital points and 80 analog points. This time can be greater depending of programming factors, if exists E-*.018 module the application time will be increase.

System Configurations

Suggested configurations using PO4053 are shown:
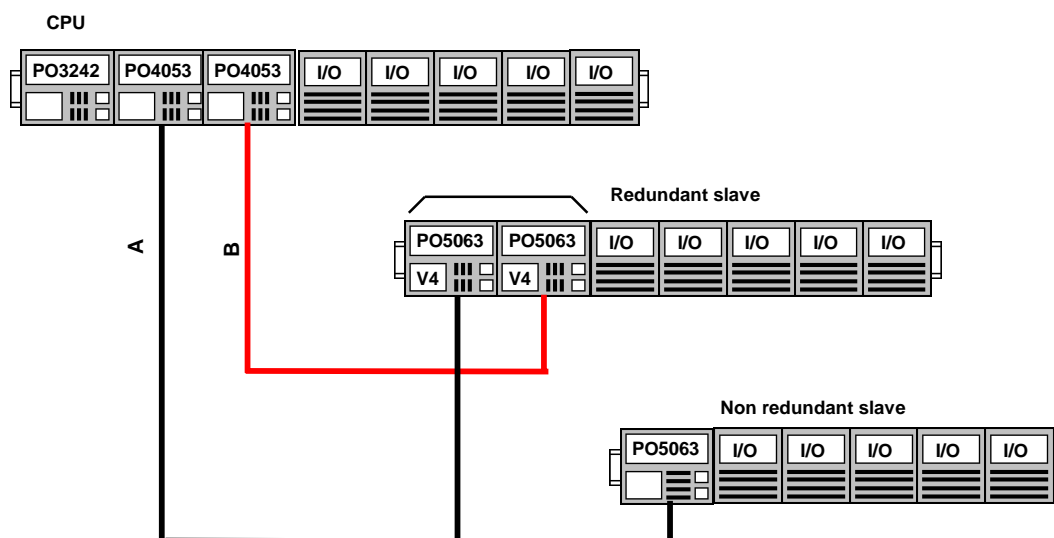
Configuration A

Basics configuration contains one PO4053 attached to PO3242 or PO3342 CPU connecting slaves through PROFIBUS network.
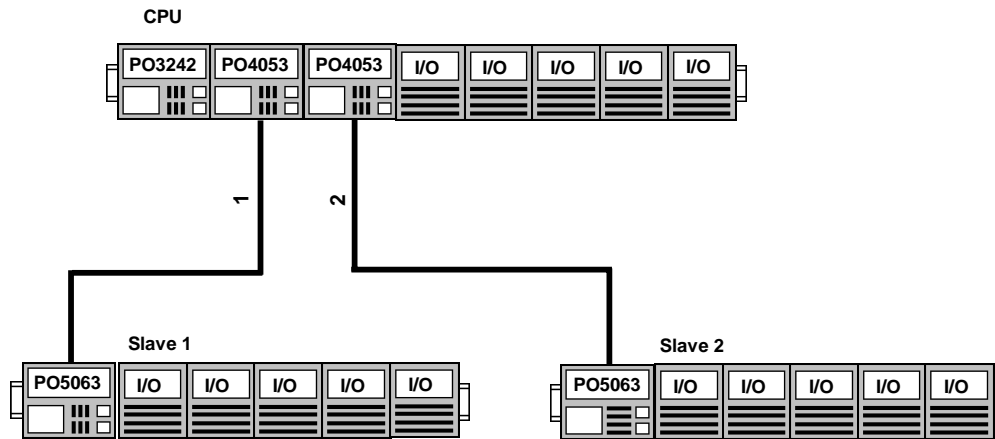

Configuration B

The suggested B configurations has **redundant** network. In this case, two PO4053 both on the same UCP PO3242 or PO3342 bus are used, both with the same net configuration.

Th redundant network allows system operation ever if a fail occurs in one slave head, or having na interruption of a data line, or failure in one of the master interfaces. The non redundant slave can be substituted by any other PROFIBUS-DP compliant slave

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Configuration C

Configuration C shows a UCP PO3242 with two interfaces PO4053 in two independent PROFIBUS networks. In this case there's no redundancy, and each net can contains 126 slave devices.

CPU

| PO3242 | PO4053 | PO4053 | I/O | I/O | I/O | I/O | I/O |

1 **2**

Slave 1

| PO5063 | I/O | I/O | I/O | I/O | I/O |

Slave 2

| PO5063 | I/O | I/O | I/O | I/O | I/O |

Configuration D

Configuration D shows two independent and redundant PROFIBUS networks (redundant version of configuration C). This is the bigger master PROFIBUS configuration supported by CPU's PO3242/PO3342.

Note that in the example the PO4053 modules are not side by side.
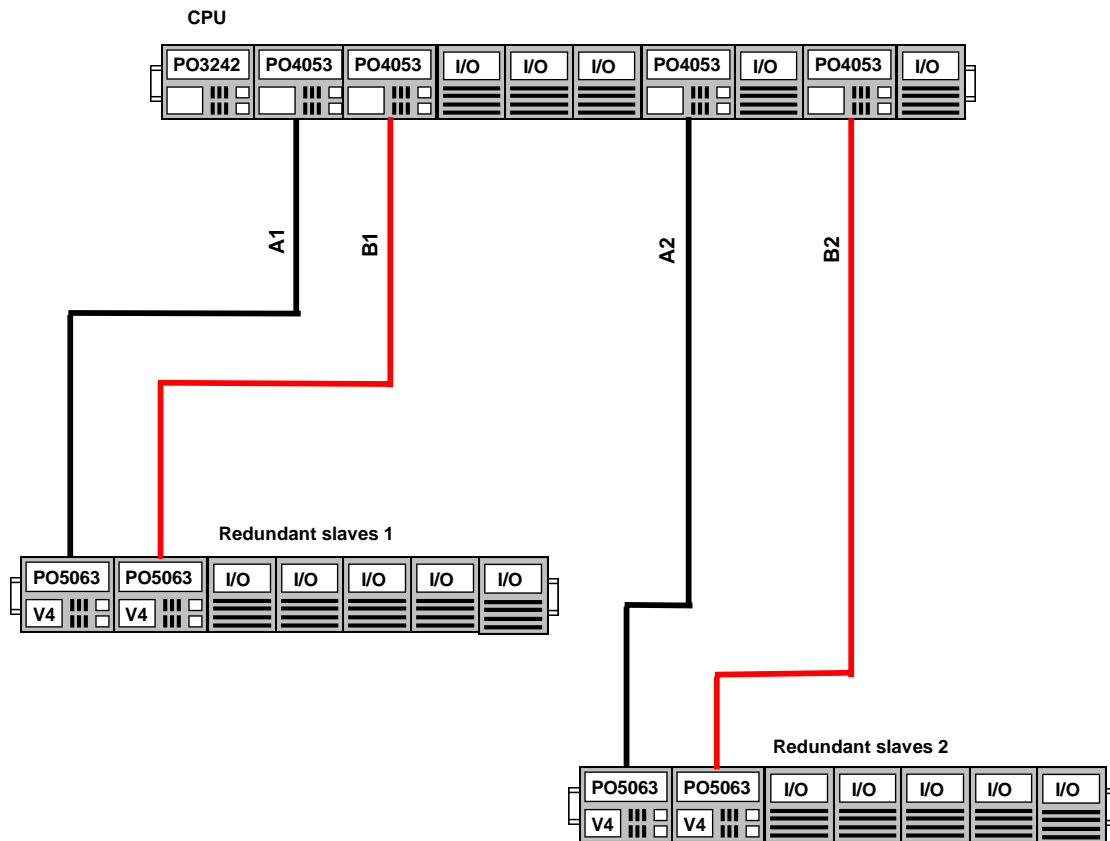
Hot-Expandability

PROFIBUS nets are difficult to modify during operation. This limitation is inherent to net topology where cabe interruption is not allowed. Th resistive terminations in net extremes are used to eliminate reflections and cannot be disconnected during operation.

To resolve this limitation PO4053 offers the characteristic of hot expandability.

When we have a redundant system where redundant heads PROFIBUS PO5053V4 connected to nets A and B, the user can force the change of the state of the heads through a *switchOver* command, passing all slaves to the B netowrk, per example, having the A network free to make the necessary modifications.

After modifications on net A are done, the network A master P04053 also must be configured, and after that, a new *SwitchOver* command is done to pass all slaves to network A and then modify network B.
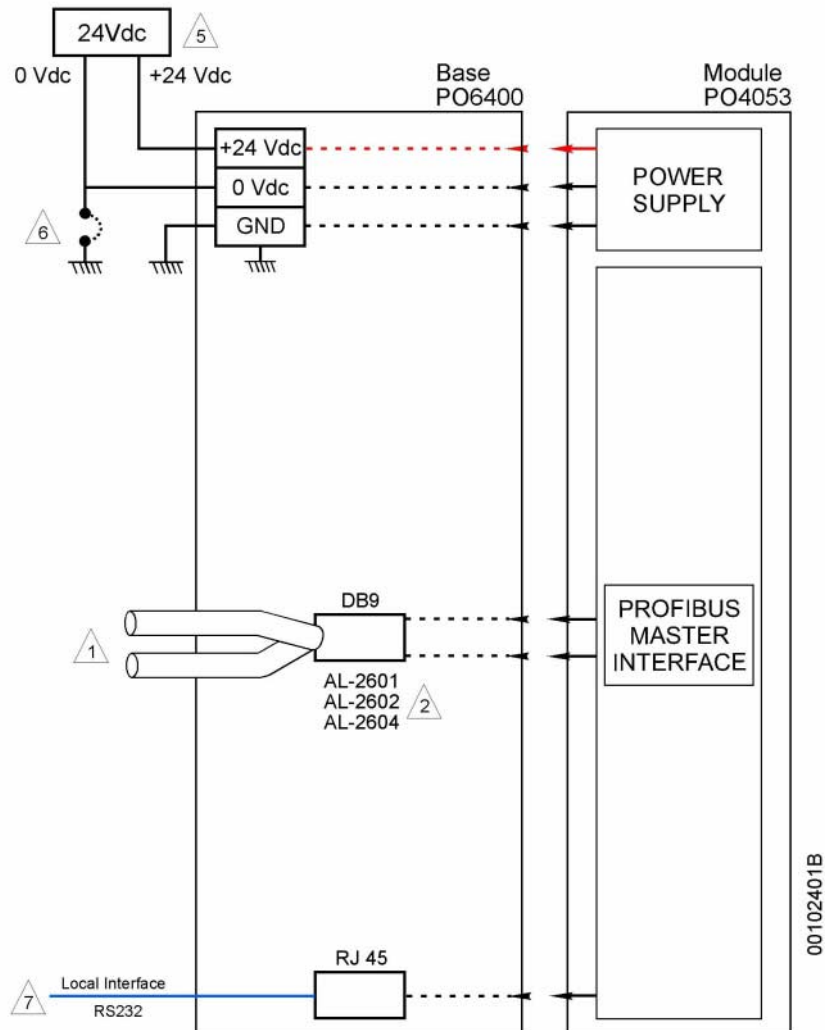
More details about *SwitchOver* operation are available in PO4053 Utilization Manual (MU209903).

Installation

Electric Installation

The diagram shows 24V power supply and PROFIBUS cable wiring with PO4053 module installed on PO6400 base. MU209903 - PO4053 Utilization Manual must be consulted for greater details.

Notes on diagram

1 – Cable AL-2303 length must be used according PROFIBUS standard – consult PROFIBUS Utilization Manual - MU299026. In case the system topology needs greater cable lengths we recommend the use of PROFIBUS AL-2431 or AL-2432 optical repeaters.

2 – There are tree types of connectors. In case the Net Interface be connected to na physical extreme of the PROFIBUS net, the termination of AL-2604 connector must be switched on, or you may use AL-2602 connector which contains the termination. The cable shield must be connected to metal body of the connector, according to PROFIBUS standard in order to ground all devices in the net.

5 – The 24 V power supply is connected to the terminals labeled " + 24 Vdc ", " 0 Vdc " and ground to " GND ".

6 – The module power supply common point (0 Vdc) may be connected to electric panel ground. This connection is not mandatory but is recommended to avoid electrical noise in automation systems.

7- RJ45-RS232 standard interface for configuration.

Mechanical Mounting

The mechanical mounting of this module is described in PONTO series Utilization Manual, and there is no any particular issue on installation of this module.

The mechanical code to be adjusted on the mounting base is 53 (5 in A key and 3 in B key) .

Configuration and Parameterization

Interface configuration and parameterization is done with ProfiTool software.

- Permits net configuration
- Permits point a monitoring and forcing

The interface parameters are described in the Utilization Manual been related to his operation mode.

GSD File

The interface parameterization options are defined in the PROFIBUS standard file called GSD. This file is delivered in ProfiTool software and also available on www.altus.com.br .

Diagnostic

The interface and modules diagnostic are available to application program through configured operands by MasterTool.
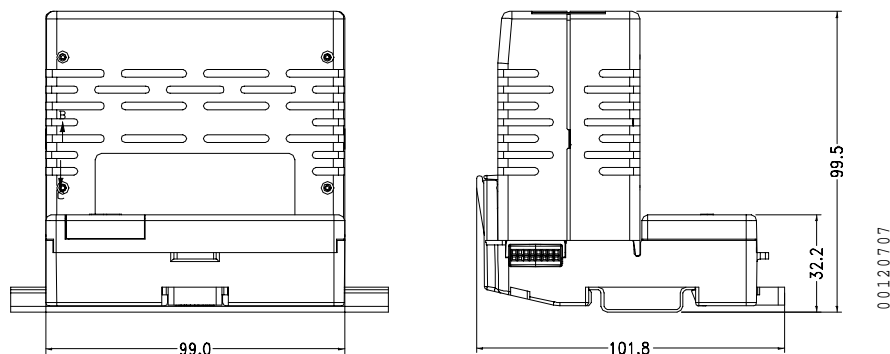
Diagnostic LEDs

State and diagnostic LEDs are described in the Utilization Manual.

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Physical Dimensions

Dimensions in mm.

PONTO series installation Manual must be consulted for panel dimensioning.

Manuals

For using **PO4053 – PROFIBUS Network Interface** the Utilization Manual **(MU209903)** must be consulted.

For better technical details in dos PONTO series products configuration, installation and programming, The following documents must be consulted:

Document number	Description
MU209903	Manual de Utilização PO4053
MU299026	Manual Utilização Rede PROFIBUS
MU209000	Manual de Utilização da Série Ponto IP20
MU209104	Manual de Utilização PO3x42
MU299032	Manual de Utilização ProfiTool
MU299025	Manual de Utilização MT4000 (MasterTool)
MP399101	Manual de Programação MT4100 Série PONTO (MasterTool)
MU209001	Manual de Utilização do Repetidor Ótico/FOCUS PROFIBUS
MU204631	Manual de Características Técnicas da Série PONTO
MU299040	Manual de Utilização do MT6000 (MasterTool ProPonto)
CT109000	Características Gerais da Série Ponto
CT104631	Repetidor Ótico/FOCUS PROFIBUS AL-2431 e AL-2432
CT104701	Conector PROFIBUS AL-2601/2602
CT104704	Conector Inteligente PROFIBUS AL-2604
CT109xxx	CTs dos Módulos da Série Ponto
CT109080	Blocos de E/S PROFIBUS

All the above documents are available for download on site www.altus.com.br or can be purchased in printed form.