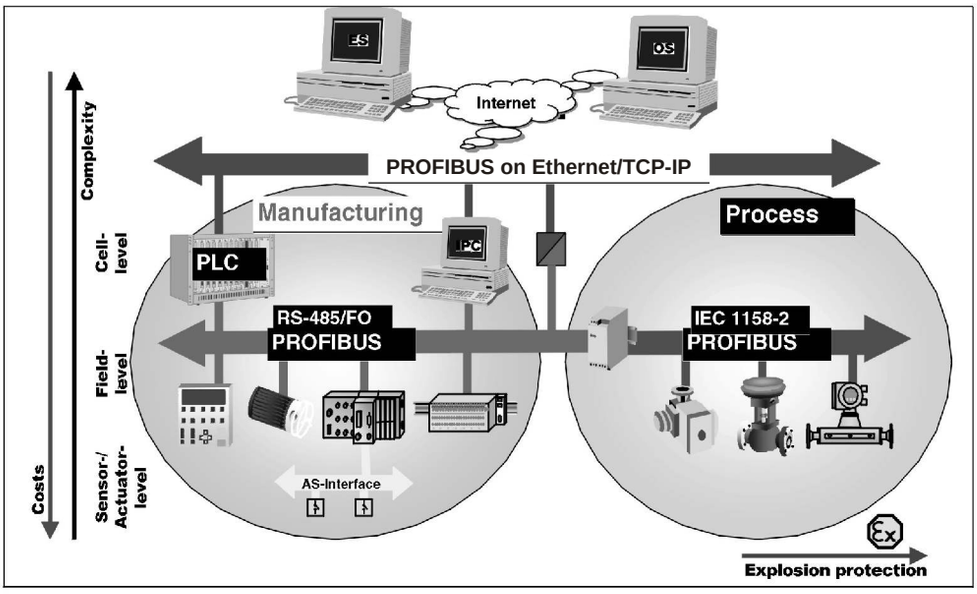
UNI EN ISO 9001

PROFIBUS INTERFACE
GENERAL DESCRIPTION



INDUSTRIAL PROFIBUS LINE

General information about PROFIBUS

The PROFIBUS (Process Field Bus) is a serial communication standard for devices inserted in automation networks (Field bus); this is an open protocol defined by DIN 19245 which has become European Standard EN 50170 volume 2. Promoted by Siemens, Profibus is very widely used in Europe and thanks to the definition of three distinct communication profiles, DP, FMS, and PA, this field bus is suitable for the majority of requirements that may arise in automation systems. This is true for applications that require high speed in the cyclical exchange of a reduced number of bits (Profibus DP) and also all the way to arriving at managing relatively complex communications between "intelligent" devices (Profibus FMS) or tasks strictly concerning process automation (Profibus PA). Hereinafter, attention will be focussed on the DP (Decentralised Periphery) version, which is the standard solution for managing devices through a bus which in the majority of cases are I/O modules, sensors/transducers or actuators at a low level in automation systems.

PROFIBUS DP characteristics

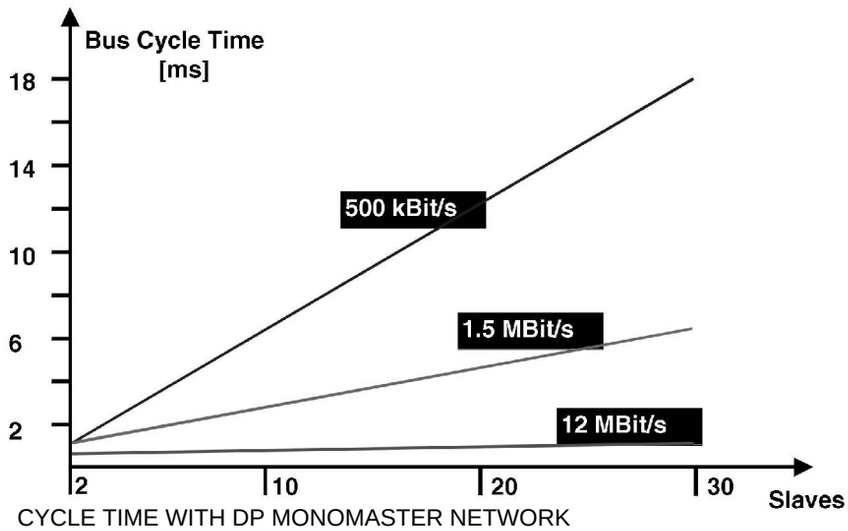
-NETWORK TYPOLOGY: the structure is typical of a bus (terminated at the physical ends) in which up to 126 devices can be connected at the same time. If the physical support is an RS485 interface, up to 32 nodes can be inserted into the network, without having to insert signal repeaters/re-generators.

-PHYSICAL LEVEL: apart from the RS485 differential transmission serial technology, it is possible to use fibre optic connection; note that in any case, DP and FMS devices can co-exist in the same network, given that they use the same physical communication interface (in reality they are the same levels 1 and 2 of the ISO/OSI stack). The standard establishes very precise Baud Rate communication from a minimum of 9.6 kBaud up to a maximum of 12Mbaud.

-DEVICES PRESENT IN THE NETWORK : distinction is in fact made between the three possible classes of apparatus: Master DP - class 1 (DPM1), Master DP - class 2 (DPM2) and Slave. The first class includes all the devices that can cyclically exchange information with the distributed periphery; in other words, they can directly manage the data exchange of I/O in the network with the other nodes, mainly the slaves. Class 2 masters on the other hand are for configuration and monitoring functions for the status of the network and the devices connected to it, The slaves have the task of directly exchanging information with the world outside, both incoming and outgoing. Typical examples of slaves are digital I/O, encoders, drives, various transducers, etc.

- BUS ACCESS MODES: this bus has the possibility of mono-master or multi-master operation it is necessary to distinguish two cases: Token Passing for information exchange about the management of the network between the different masters present and the classical polling interrogation concerning master-slave communication.
-MAIN FUNCTIONS: as follows, we briefly list the fundamental peculiarities of Profibus DP with reference to the main functions implemented in the protocol:

-Cyclical data exchange: each master is configured in a way so that after the initial slave management phases, (parameter setting and configuration phases) it can exchange up to a maximum of 244 input bytes and 244 output bytes with each slave. The timing of this data exchange depends on the communication Baud Rate, the nodes present in the network and the specific bus settings. Given the possibility of arriving up to 12 Mbaud with the Profibus DP, it is one of the fastest field busses.



CYCLE TIME WITH DP MONOMASTER NETWORK

-Synchronisation: control commands are available (sent from the master in multicast) so as to synchronise the acquisitions by one slave, a group or all the slaves (Freeze Mode), and the same for the output data sent to the slaves (Sync Mode).

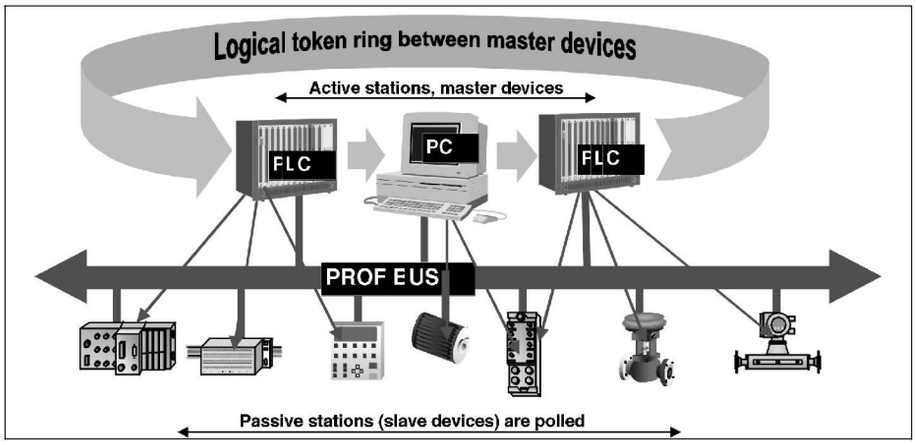
-Security in parameter setting and configuration: each slave added into the network must be congruent with what the master has organised for its management; the cyclical exchange between the master and slave cannot take place if there are any discrepancies of this kind.

-Protection Mechanisms: a mechanism is present, whereby both the master/s and the slaves, the system overall goes into a safety status in the event communication between master and slave is not repeated after a certain pre-fixed time; past this time, in multi-master networks, each master can read all the slaves but can only write on those that it set the parameters for and configured.

-Diagnostic functions: it is possible to ask the master that set the parameters of a slave to read its diagnostics; in this way it is possible to rapidly localise any problems possibly present in the slave. Also in this case, the diagnostic can contain up to 244 bytes of information, the first 6 bytes of which are obligatory for each DP slave.

-Dynamic slave management: the slaves present in the system can be dynamically activated or disabled. In this way, it is possible to use the bus to change the address of the slaves that make this function possible.

-Easy network configuration: the main characteristics of each device present in the network are listed in the form of a GSD file, according to the precise syntax present in the Profibus specifications. This makes setting the parameters and configuring the device easy using graphic tools suitable for the purpose: an example could be the Siemens COM PROFIBUS software.



A SINGLE NETWORK CONFIGURATIONS

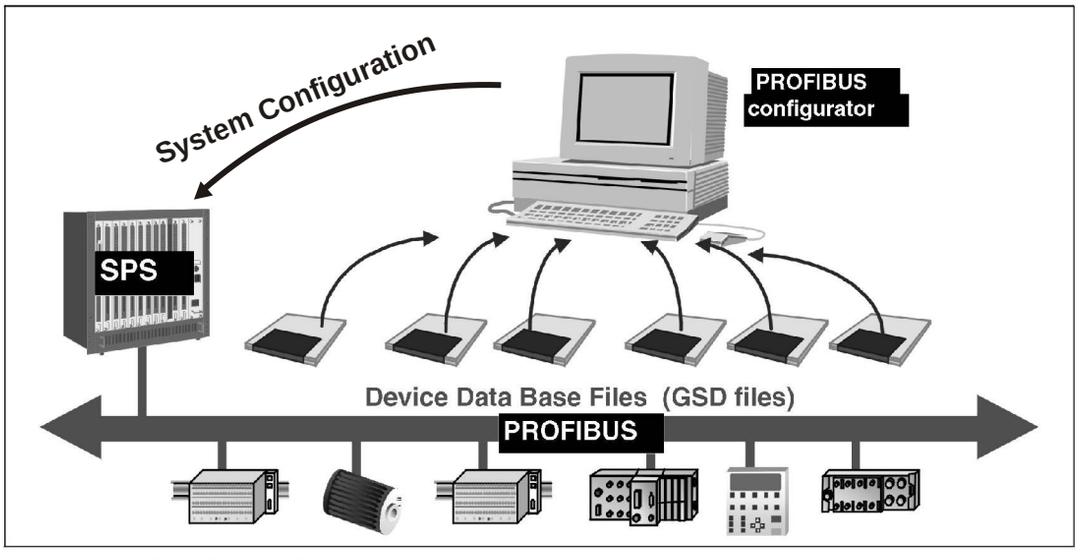
Master - Slave communications

As already mentioned, the master-slave data exchange takes place cyclically at well defined times, that essentially depend on the topology of the network and the number of nodes present. Before exchange can take place however, it is necessary for the slave parameter setting and configuration phases to have been successful. We now supply some further information about this.

Parameter setting: thanks to this phase, the master sends the slave a series of operating parameters necessary to specify its operation; the standard imposes the sending of 7 obligatory byes containing the information indispensable for the slave and if there is more data this will be introduced starting from the eighth byte in the DU field (Data Unit, see the Profibus DP specifications for more information) of the communication frame up to a maximum possible 224 bytes.

Configuration: this phase can only take place once the master has successfully set the slave's parameters. Here, the master specifies the number and type of data, or better, how many bytes to exchange with the slave both incoming and outgoing. This data is also present in the DU field of the communication frame; if the slave accepts the configuration, it can go on to exchange cyclically with the master.

Cyclical exchange: the master inserts the data it intends to send to a particular slave in the DU field of the frame and receives from the same the input data from the peripheral again in the DU field of the reply frame. During this phase, the slave can advise the master that it has the new diagnostic ready and therefore asks if the master is going to read this information and not the input data from the peripheral in the next polling.



NETWORK CONFIGURATIONS BETWEEN THE GDS FILES

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