

DEP SPECIFICATION

INTEGRATION OF MOTOR CONTROLS INTO BPCS FOR GLOBAL APPLICATION

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the integration of motor control and electrical equipment into a BPCS (Basic Process Control System).

This DEP provides requirements for design and implementation of low voltage (690 volt or less) motor control integrated into a BPCS. It covers typical motor implementations across all Shell Businesses. Special applications or specialty motors are not covered within this DEP due to the detailed engineering requirement for the specific application.

Where packaged equipment contains electric motors, then it might not be possible to follow this DEP; interfacing with these motors is determined on a case-by-case basis.

This DEP recommends the technology to use for integration of Motor Control into the BPCS and provides direction on how best to implement the integration technology. The use of HV/MV motor control deploying IEC 61850 GOOSE messaging is out of the scope of this DEP."

This initial release of the DEP direction for technologies is common with North American standards; however many of the concepts are valid for all projects. This DEP provides additional details of implementation consistent with IEC standards and Shell IMCS (Integrated Motor Control Systems). The following serial communication technologies are being outlined in this DEP.

PROFIBUS™ is a trademarked technology. Within this DEP, wherever Profibus is used, it refers to PROFIBUS™.

Modbus/TCP™ is a trademarked technology. Within this DEP, wherever ModBus/TCP is used, it refers to ModBus/TCP™

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This is a revision of the DEP of the same number dated February 2012; see (1.5) regarding the changes.

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This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Adapter	Provides connection between the device (e.g., drive, protection relay) and the DeviceNet network. An adapter is also known as a communications interface.
BPCS	Basic Process Control System. This generic name covers any control system architecture albeit based on a BPCS or a PLC platform. A BPCS does not include a Safety Instrumented System within the definition. Other names for a BPCS are DCS (Distributed Control System), IACS (Industrial Automation Control System), or PAS (Process Automation System).
Controller	A controller, also called programmable logic controller, is a solid-state control system that has a user-programmable memory for storage of instructions to implement specific functions such as I/O control, logic, timing, counting, report generation, communication, arithmetic, and data file manipulation. A controller consists of a central processor, input/output interface, and memory. See also Scanner.
Cyclic communications	A device configured to produce a cyclic I/O message will produce its data at a precisely defined interval. This type of I/O messaging allows the user to configure the system to produce data at a rate appropriate for the application.
DeviceNet network	A DeviceNet network uses a producer/consumer Controller Area Network (CAN) to connect devices (e.g., controllers, drives, protection relays). Both I/O and explicit messages can be transmitted over the network. A DeviceNet network can support a maximum of 64 devices where each device must have a unique address. As well, all devices must communicate at the same data rate (to avoid network problems). A DeviceNet network communicates on a cable which supplies both power (24 V DC) and communications to the devices. General information about DeviceNet and the DeviceNet specification are maintained by the Open DeviceNet Vendor Association (ODVA). ODVA is online at http://www.odva.org .

Term	Definition
Electronic Data Sheet (EDS) files	EDS files are simple text files that are used by network configuration tools for DeviceNet to describe products so that you can easily commission them on a network. EDS files describe a product device type, revision, and configurable parameters.
EtherNet/IP	EtherNet/IP is an application layer protocol treating devices on the network as a series of "objects". EtherNet/IP is built on the Common Industrial Protocol (CIP), for access to objects from ControlNet and DeviceNet networks using the Ethernet physical layer network infrastructure.
GSD	General System Data or also General Station Description is a file that contains general information about the slave device including communication of both cyclic data and cyclic diagnostic data. A GSD file is required by the network configuration software to configure the slave device on the Profibus network. A GSD file is relevant to the Profibus Protocol only.
Logic Solver	The electromechanical, electronic and/or programmable electronic Logic Solver component of the Safety Instrumented Function, complete with input and output equipment.
Modbus/TCP	Is a Modbus variant used for communications of Modbus RTU (compact, binary representation of data) protocol over TCP/IP networks.
Node address	A DeviceNet network can have as many as 64 devices connected to it. Each device on the network must have a unique node address between 0 and 63. Node address 63 is the default used by un-commissioned devices. Node addresses are sometimes called "MAC IDs."
ODVA	Open DeviceNet Vendor Association (ODVA) is an international association comprised of members from the world's leading automation companies.
Polled communications	A slave configured for polled I/O will receive "output" data from the master device in a sequential order that is defined by the master's scan list. The master's polling rate is determined by the number of nodes in the scan list, the DeviceNet baud rate, the size of the messages, and the internal timing of the master device.
PROFIBUS	PROcess FieldBUS is an open, digital industrial protocol designed to allow networking of a variety of devices, particularly in the fields of factory and process automation. IEC 61784-1: Communication network according communication profile family 3 (CPF3); incorporating application profiles and system integration aspects like interfaces and languages for engineering tools and HMI.
Profibus DP	Acronym for "ProfiBus for Decentralized Peripherals". Profibus DP is standardised within IEC 61158 and IEC 61784, communication profile families 3/1 and 3/2. The term "Profibus DP" also is a synonym for the RS-485 based deployments within factories.

Term	Definition
Profibus DP-Master Class 1	DPM1 is typically a PLC or BPCS communicating with other masters or slave devices for information/control. A DPM1 is a central controller which exchanges information with the decentralised stations (i.e. DP slaves) within a specified message cycle
Profibus DP-Master Class 2	DPM2 is typically a PC or diagnostic device used for programming, configuration of the Profibus slave devices, or for diagnostics of the devices. DPM2 devices are programmers, configuration devices or operator panels. They are used during commissioning for configuration of the DP system or for operation and monitoring purposes which can be used to set device parameters via acyclical communication. A DPM2 need not be permanently connected to the bus system.
Ride Through	The contactor will either stay closed during the voltage dip duration or will immediately reclose on restoration of supply within the defined period (200ms).
Restart	The contactor will re-close if voltage is restored within the defined voltage dip duration (between 200 ms and 4 s). The restart command for each drive might be time delayed to limit total of starting currents from overloading the system and command might also be inhibited or enabled by process requirements.
RS-485	Refers to the standard transfer technology for Profibus that operates with a data transfer technology according to the RS-485 standard. Profibus RS-485 is used for the data transfer with Profibus DP. It allows high data transfer rates and is primarily used in factory automation.
Scanner	A scanner is a separate module (of a multi-module controller) or a built-in component (of a single-module controller) that provides communication with adapters connected to a network.
SIF	A function comprising one or more sensors, a Logic Solver and one or more Final Elements whose purpose is to prevent or mitigate hazardous situations and that have SIL 1, SIL 2, SIL 3 or SIL 4. A SIF is intended to achieve or maintain a safe state for the process, in respect of a specific hazardous event.
SIS	Instrumented system used to implement one or more safety instrumented functions (SIF). A SIS is composed of any combination of sensor (s), logic solver(s), and final elements(s). A SIS is a collection of SIFs (including sensors and final elements) that together protect a process unit or major piece of equipment.
Terminator	As IEC 61158-2: A resistor connecting conductor pairs at both ends of a wire medium segment to prevent reflections from occurring at the ends of cables. Ideally, it should be the wave impedance of the wire.

1.3.3 Abbreviations

Term	Definition
CIP	Common Industrial Protocol
DCS	Distributed Control System. Also referred to as BPCS (Basic Process Control System)