



TECHNICAL REQUIREMENTS

AUTOMATION AND INSTRUMENTATION

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DISTRIBUTED CONTROL SYSTEM

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1. SCOPE

This Specification covers requirements for Distributed Control System (DCS).

2. REFERENCES

The latest editions of the following publications are to be used with this Specification as applicable:

LST EN 60079	<i>Electrical apparatus for explosive gas atmospheres. Elektriniai aparatai, naudojami potencialiai sprogiose atmosferose</i>
LST EN 60529	<i>Degrees of protection provided by enclosures (IP code) (IEC 60529:)</i>
LST EN 62381	<i>Automation systems in the process industry - Factory acceptance test (FAT), site acceptance test (SAT) and site integration test (SIT) (IEC 62381)</i>
LST EN 62382	<i>Electrical and instrumentation loop check (IEC 62382)</i>
NAMUR NE 43	<i>Standardization of the Signal Level for the Failure Information of Digital Transmitters (NAMUR NE 43)</i>
OL-TR-GR-000	<i>General Requirements</i>
OL-TR-IR-000	<i>Automation and Instrumentation. General</i>

3. TERMS AND DEFINITIONS

For terms and definitions see:

OL-TR-IR-000	<i>Automation and Instrumentation. General</i>
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4. SOFTWARE OF DCS SYSTEM

System Software:

- 4.1** System DCS shall be delivered with all applicable licenses including, but not limited to, licenses for configuration, operation, communication software, software for making and reproduction of the safety copy, for number of points (including minimum 20 % redundancy) and for software of third party companies, used in the system. Vendor shall exactly specify the list of the software items including revision dates and numbers as well as the license extent.
- 4.2** A copy of the entire system software loaded to the system shall be delivered on the data carrier enabling re-loading of the software.
- 4.3** Application logic shall be implemented in one of the following programming languages: Cause/Effect Matrix, Function Block Diagram, Sequential Function Chart, or Ladder Logic.

- 4.4** More functions that are complex shall be carefully documented as to their exact function.
- 4.5** The programming software package supplied by PLC Vendor should provide as a minimum:
- a) System configuration.
 - b) Programming and editing the PLC application software with the CPU not in RUN mode.
 - c) Through a key lock or password, programming and editing the PLC application software with the CPU in RUN mode.
 - d) Storage of identification label and rung comments of PLC addresses associated with inputs, outputs, and internally generated function blocks.
 - e) Cross-reference symbol tables for variables, contacts, coils, and function blocks.
 - f) Interrogation of the CPU and I/O racks to aid in user diagnosis of internal PLC errors.
 - g) FAULT diagnostic of DCS / ESD analog signal ranges according NAMUR NE 43 recommendations. Fault measurement ranges $\leq 3,6$ mA and $\geq 21,2$ mA.
 - h) Capability of forcing/unforcing contacts and coils.
 - i) Power flow display.
 - j) File retrieving, saving, and other utilities (copy, rename, etc.).
 - k) Program printing.
 - l) DCS/ESD Database of wiring list (by Excel format).
- 4.6** Any software failures and bugs found during the project course (including the warranty period) shall be free of charge eliminated by the Vendor. Upon eliminating of the software failures and bugs, the Vendor has to demonstrate that the problem does not exist and must deliver a new copy with corrected software.
- 4.7** System DCS shall allow for remote diagnostic and monitoring access by using specialized restricting and protecting software shall have anti-virus protection integrated. The solution shall be agreed with OL E&A .

5. APPLICATION SOFTWARE

The Vendor shall provide two following options:

- 5.1** The Vendor shall prepare the application software based on delivered design documentation. The offer shall cover of the following:
- a) Cost of the application software.
 - b) Cost of workshop tests.
 - c) Engineering training of the OL specialists in basic, advanced and diagnostic aspects.
 - d) Cost of testing and commissioning of the software on the site.
 - e) Cost of consultation and co-operation with the OL specialists, with indication of quantity, duration and place of the consultations (premises of the Buyer and / or the Vendor).
- 5.2** The application software is to be accomplished by the OL specialists. For that purpose, the Vendor has to provide the following in the offer:
- a) Suitable hardware and software for execution of configuration works. If the OL has no suitable hardware, then the Vendor can to hire it or deliver in advance (the engineering station, for instance).
 - b) Engineering training of the OL specialists in basic, advanced and diagnostic aspects.

- c) Cost of consultation and co-operation with the OL specialists, with indication of quantity, duration and place of the consultations (premises of OL and / or the Vendor).
- d) Cost of workshop tests.
- e) Cost per day for the Vendor's specialist during his stay for commissioning of the plant.
- f) OL shall inform the Vendor about chosen option of the applicable software in 8 days prior to placement of the order.

6. ADVANCED PROCESS CONTROL (APC)

Advanced Process Control (APC), if it will be the case, will be the subject of the separate order. In every case, the system shall enable its implementation, which means that:

- 6.1 The system shall have open architecture enabling implementation of the advanced process control techniques run in the primary computers working in the system or connected via communication connectors as per the open standards (e.g. OPC). It means, first of all, a possibility of writing the application software programs in high-level languages, API library for programs written in standard languages of C++ or VB types.
- 6.2 Any APC application facilitating software tools in the system shall be indicated and priced in the offer.

7. PRIMARY FUNCTIONS OF DCS SYSTEM

As a minimum, the system shall assure the following:

- 7.1 Measurements, state monitoring, alarm handling.
- 7.2 Continuous and discrete control.
- 7.3 Binary controls (Boole's logic).
- 7.4 Sequential control (primary in relation to primary controllers).
- 7.5 Complex mathematics calculations.
- 7.6 Standard communication protocols (e.g. ModbusB) for external sub-systems (ESD, PLC, Fire and Gas monitoring, etc.).
- 7.7 "On-line" historization (recording and reproducing) of all analogue variables (min. half a year) and alarms, events and operator's actions (min. 100 000 items).
- 7.8 Data "off-line" archiving on external data carriers including a possibility of unrestricted reproduction the data for „on line" insight.
- 7.9 Alarm Management System according to *Publication No 191: Alarm Systems – A Guide to Design, Management and Procurement by EEMUA: Engineering Equipment & Materials Users Association and ISA SP-18.02 Management of Alarm Systems for the Process Industries.*
- 7.10 Hardware and software mechanisms of linking with external systems of APC, Optimizer type. The connections shall base on the standards, which are obligatory in industry (OPC, ODBC, DDE, DD and DA). For linking with the real-time system – PI

(mechanism as per OPC standard), a delivery of exclusively intended for that purpose hardware and software set is required.

- 7.11** Safe execution of the primary measuring and controlling functions owing to appropriate level of hardware and software redundancy.
- 7.12** A possibility of future modification and extension of the software and “on-line” hardware.
- 7.13** To accomplish the aforementioned functions, the system shall contain a library of functional tools, which – when configured – will enable data processing as well as the primary and advanced measuring and controlling functions.
- 7.14** As a minimum, the following function shall be possible:
- a) Regulations of PID type.
 - b) Linearization, approximation, filtration and limitation of signals.
 - c) Bump less switching-over between manual / automatic / cascade controls.
 - d) Forcing the controller to go in defined operation mode with predetermined set point or output upon the logic input going high or low.
 - e) Alarming of exceeds beyond low and high alarm thresholds on measurements and control signals (minimum two high and two low levels), controller error (PV – SP) low and high and of change rate of measuring and control signals.
 - f) Alarming at predefined value of binary signal.
 - g) Complex mathematics calculations and logic functions.
 - h) Sequence control.
 - i) Control by means of the software written in the high-level languages of Control Language type.
 - j) Detection of damaged measuring and scaling with alarming and freezing or acknowledging the predefined value for measurement or control signal.
- 7.15** A redundancy of the individual modules in the system shall be used in order to increase the operation reliability of the system. When the redundancy is implemented, a faulty operation or damage of the one of the module in redundant pair (checked by integrated diagnostic software) as well as switching-over by operator to spare module shall not disturb operation of the plant. The system shall be protected against switching-over to damage or faulty functioning modules. Each damaged of DCS system shall be alarmed and reported to operators. Servicing and replacement of damaged modules shall be possible without disturbing normal operation of the plant. Redundancy of I/O modules will be defined individually for the application.
- 7.16** Redundancy of the entire DCS system shall be provided by the following:
- a) Non-redundant operator stations running the same software of identical functionality.
 - b) Fully redundant high speed system bus.
 - c) Redundant processors performing control strategies (it does not refer to historization and archiving).
 - d) Redundant communication connections for external sub-systems.
 - e) Connections to the common Ethernet net in the company via the routers filtering the access. A type and version of the router shall be agreed with the Information technology division (ITD) on individual basis.
- 7.17** Interfaces of smart transmitters and positioners will be connected to I/O modules while leaving a possibility of their future connecting (via communication bus bar) with servicing station enabling diagnostic and reconfiguration of the field instruments. Two-way communication will enable configuration, viewing and modification of the transmitter parameters by the user. All parameters shall be achievable by servicing

station or hand held communicator. Separation in time of the diagnostic functions and the field instrument parameterization is foreseen.

- 7.18** Integration of the equipment diagnostic function in the control system is not recommended.
- 7.19** History and archive system shall assure data registration, acquisition and displaying on operator stations as well as printing and unrestricted defining of reports.
- 7.20** “On-line” historization shall assure recording of all instantaneous, average, minimal and maximal analogue values defined in time intervals for minimum half-year operation of the plant.
- 7.21** Archive system is for the long-term (many years) storage of the plant operation recorded parameters. It shall assure an automatic registration of historical data (analogue, alarms and operator actions) on external data carriers. Transfer (using FTP, as an example) of files to the servers for archive data storage is allowed. The system shall provide reproduction, presentation on operator stations and accessibility for reporting packages and external systems of archived data.
- 7.22** The system shall provide a possibility of “unrestricted” defining of reports. As a minimum, the reports of material and utility balances, average operational parameters of the plant, alarms and operator actions are foreseen. The report shall enable incorporation of any information including (but not limited to) the site name, date and time, codes, media names, piping numbers, actual, calculated and histories values, arithmetical calculations, etc. The reports shall be automatically initiated at predefined time or in result of a specific external event or on demand of the operator or process engineer. Generated report shall be printed on the system printer and stored on the hard disk; reading and printing of the report shall be possible later on. If any software from the third party’s companies (e.g. Excel, Data Direct, etc.) is indispensable for report generation, it has to be delivered with applicable licenses. A possibility of automatic transferring (e-mail) of the reports to desired recipients is preferred.
- 7.23** The operator interface shall provide the following hardware possibilities, as a minimum:
- a) The operator stations enable to service minimum two independent screens of identical functionality.
 - b) Universal key-boards with pointing facilities (mouse, track-ball, touching screen).
 - c) Special operator’s key-boards.
 - d) Panels for alarm signaling and quick displaying of the alarm-related screens.
 - e) Alarm acoustic signaling with different sounds depending on the alarm priority (minimum three priorities) and type (process, system, software alarms).
 - f) System printers: Laser Jet printer for report printing, color printer for printing of screen copies and trend plots, line printer for the alarm actual printing.
 - g) Redundant communication with controllers.
 - h) By OL approval Operator stations shall have UPS for safe close of the operation system and application during longer failures of electric power.
- 7.24** Software of the operator interface shall provide the following hierarchic access to displays as per the OL requirements (according to Operator (Human) – Computer interface according to *EEMUA 201 Process Plant Control Desks Utilizing Human-Computer Interfaces according - A Guide to Design, Operational and Human Interface Issues*).
- 7.25** These are the following displays:
- a) Group display of control loop, measuring and alarm points.
 - b) Areas consisting few groups.

- c) Overview – general display of alarm conditions in the process plant sections and possible display of detailed alarm screen of particular section (system or defined process graphs).
- d) Trend display - minimum four charts in the window – more than one window on the screen.
- e) Tag configuration details (possible change of alarm settings, on/off points, alarm priorities).
- f) Tuning of the control loop.
- g) System diagnostic displays.
- h) Plant powering system including UPS operational status.
- i) Power distribution to instrument cabinets, including DCS sub-assemblies, and diagnostics of their operation conditions (temperature, humidity contact status).
- j) Plant material and utility balances.
- k) Operator interface with PLC controller of ESD system, including dedicated displays of MOS contact status.
- l) Operator interface with PLC controllers from package deliveries.
- m) Diagnostics of PLC controllers co-operating with DCS.
- n) Fire Monitoring System display.
- o) Combustible and toxic gas monitoring system display.
- p) Machine Monitoring System displays.
- q) Other operator interface displays agreed with the OL (necessary for safe operation of the plant).
- r) Control system's SCADA must have language selection/change function (English, Lithuanian) (language translation in process schemes, archives, message windows and etc.).

7.26 Freely construed interactive process graphs meeting the following conditions:

- a) Minimum 256 color gamut of colors.
- b) Animation of graphs.
- c) Animation of alarms for displayed measured values; distinguishing between not acknowledged incoming alarm, acknowledged, outgoing – depending on priority.
- d) Possible display (as an overlay) of dialogues for control loops enabling alteration of operation modes, settings, commend generation.
- e) Possible displaying of objects which – in turn – display another system or process graphs, also in the form of an overlay (a new graph in a new window without cancellation of those already existing).
- f) If dynamic parameters for graphs are limited, they have to be distinctly defined by the Vendor.

7.27 In addition to the process graphs resulting from P&ID, the following ones shall be anticipated:

- a) Plant electric power supply, including UPS operation status.
- b) Power distribution to instrumentation cabinets, including DCS sub-systems and diagnostics of DCS sub-system operation conditions (temperature, contact status).
- c) Plant material and utility balances.
- d) Operator interface with PLC controller of ESD system, including dedicated displays of MOS contact status.
- e) Operator interface with PLC controllers from package deliveries.
- f) Diagnostics of PLC controllers co-operating with DCS. The failure state of all outputs shall be reviewed with and approved by OL, including, but not limited to, the following:
 - Power loss to the CPU processor;
 - Power loss to the PLC I/O module;
 - Failure of the CPU processor;
 - Failure of the I/O module;

- Physical removal of an I/O module;
- Blown fuse in the I/O module;
- Loss of communication between CPU and an I/O module.

g) Fire Monitoring System display.

h) Combustible and toxic gas monitoring system display.

i) Machine Monitoring System displays.

j) Other operator interface displays agreed with the OL (necessary for safe operation of the plant).

- 7.28** Regardless being currently displayed the system display or process graph, information about actually generated new process and software alarms as well as system diagnostic shall appear on the screen. The newly generated process alarms shall be identified with the tag name and its description as well as the actually measured value. The system shall assure quick displaying of dedicated display for specific alarm (single click on chosen alarm signaling).
- 7.29** Access to the operator station shall be dependent on granted authorizations for user. There must be a simple mechanism of logging and identification of users. As a minimum, access on the level of operator, chief operator, and engineer shall be available. Different users shall be identified on each level by means of name and password. Any change of the user shall be registered in the system (history, logger).
- 7.30** The system shall guarantee a possibility of actual printing of the alarms and operator's actions on the system printer, so-called logger (line printer). Filtering of printed alarm types as well as the printing suspension, activating and deactivating shall be possible.
- 7.31** The system has to guarantee a possibility of defining access to the process facility depending on the logged user. It shall be understood as access to displayed information, alarm announcing and ability of affecting the process. Any given user can have unrestricted, "only for read-out" or forbidden access to selected sections of the plant.
- 7.32** A possibility of defining the own display arrangements on the screens by each user is desired. Defined arrangements of displays shall be automatically accessible upon the subsequent logging of any given user.
- 7.33** Displaying of other applications (e.g. documentation reviewing, programs of any other computers) shall be maximally protected so that the main functionality of the operator station was never "hidden". Access to these applications shall be dependent on granted authorizations for the user.
- 7.34** Depending on granted authorizations, activation of the system engineering tools shall be possible from the operator station. Generating the process graphs on the operator station shall be possible as a minimum. If any other functionality is inaccessible, a dedicated engineer station must be in the system. The Vendor has to define restrictions for engineer software including the following (but not limited to): from which points in the system it is accessible and in what extent – accessibility via network from other computers – a number of simultaneous work places – what licenses are to be delivered.
- 7.35** Delivery of DCS System shall include OPC Server with software enabling data exchange between DCS and Refinery Information System – PI systems OSI software). ITD/E&A will confirm the current version of the software each time.
- 7.36** Configuration of DCS System shall base on the process automation drawings and design requirements (P&ID). Requirements accepted in OL shall be met. The

configuration software with related licenses (for defined numbers of measuring points, input / outputs, etc. – depending on the Vendor's standard) shall be delivered with DCS. The final application software shall be delivered with two backup copies.

8. REPORTS

8.1 The standard configuration of the system shall generate the following reports:

- a) 24-hour report of the plant production including balance and average data.
- b) Monthly report of the plant production including balance and average data.
- c) 24-hour report of the utility consumption including balance data.
- d) Monthly report of the utility consumption including balance data.
- e) Shift report of measured 1-hour average variable values during 8-hour time interval.

8.2 Each report shall contain the following:

- a) Medium name.
- b) Medium code.
- c) Name of the process line (stream).
- d) Value of measured variable.
- e) Balance value.
- f) As a minimum, information about balance period, date, name and code of the plant, print-out time, etc.

9. SIGNALS

9.1 DCS System shall deal with the following signals:

- a) Analogue inputs: 4mA - 20 mA DC.
- b) Analogue inputs: thermocouples (J, K, E, R types).
- c) Analogue inputs: RTD (PT 100 ohm, 3-wire).
- d) Pulse inputs: 0 - 10000Hz.
- e) Digital inputs: dry contacts, signals consistent with NAMUR / DIN 19234.
- f) Analogue outputs: 4mA - 20mA DC.
- g) Digital outputs: relay and voltage (24V DC).
- h) Serial communication ports (RS232, RS485/422).
- i) TCP/IP.

9.2 The System shall provide a series communication as per Modbus RTU Protocol with implemented sub-systems, e.g. PLC for ESD, controllers from package deliveries for combustible and toxic gas monitoring, fire monitoring, machine monitoring, etc.

9.3 The System shall be supplied with the following spares:

- a) 20% on I/O cards, ready for use.
- b) 10% free space in the System Cabinets.
- c) All cores of multi-cables shall be terminated on terminal strips.

9.4 The System (revamping) shall be supplied with the following spares:

- a) 30% on I/O cards, ready for use.
- b) 20% free space in the System Cabinets.
- c) All cores of multi-cables shall be terminated on terminal strips.

9.5 All required licenses (also for software from the third's party companies if the software is used for the given application) shall be delivered with the system.

9.6 On completion and loading of the complete software, the number of all used required licenses (I/O, SCADA, DI, DO, AI, AO, tag and other, depending on the Vendor) cannot exceed 90%, with taking installed spares of I/Os into account. Unless it is attained, the

Vendor has to increase a number of licenses to the next threshold, but in such a way that a minimum spare of 10% was provided in each type.

- 9.7** CPU selection shall ensure that processor and memory loading, including data storage, shall not exceed 50 %. This shall be demonstrated prior to concluding the FAT. If this specification is not met, Vendor shall provide a larger CPU that does meet this specification at no additional cost.
- 9.8** Groupings and segregation by plant operating units of I/O points between modules for system flexibility as agreed with OL.
- 9.9** Contact ratings of relay output modules shall be sufficient to switch loads. Where current capacity requirements exceed module ratings, interposing relays shall be used. The use of solid-state discrete outputs is prohibited, with the exception of driving panel-mounted pilot lights or similar loads, mounted within 3 m of the I/O module. Isolated relay outputs shall be provided for all other discrete output requirements.
- 9.10** It must be possible to remove the I/O modules and replace them without:
- Disconnecting the field wiring from the I/O module termination assembly.
 - Removing power from the PLC or any field devices.
 - Disrupting the operation of the PLC in any way except for the functions associated with the module being replaced.
 - Incurring any damage to any circuits.
- 9.11** Fusing requirements for I/O modules are as follows:
- For internally fused I/O modules, blown fuse indication shall be provided on the front of the module. Remote indication of blown fuses, when desirable, will be specified by the OL.
 - Fuses shall be located such that they are easily accessible and that replacement shall not disrupt the operation of any other I/O module or the CPU processor.
 - All output circuits shall be individually fused with fuse-status indication. Exceptions can be made for isolated outputs that are part of a fused circuit external to the PLC panel and for non-isolated outputs that drive pilot lights located on the PLC control panel. In these cases, a common fuse per output module group shall be provided as a minimum.
 - All input circuits shall be fuse protected to minimize impact to the control system when an input circuit experiences an over-current situation. Individual protection of each input is required and OL must approve any exceptions. In no case shall a single fuse feed signals to more than one input module. A common fusing arrangement may be used with the agreement of OL, for example, if all selector switches and pushbuttons mounted on a control panel door control a single piece of equipment or a single process.
- 9.12** The aforementioned loading of the processor and memory shall guarantee the following time cycles of data updating:

Table 1. Time Cycles of Data Updating

Description	Value
Velocity or pressure	1,0 s
Flow	1,0 s
Level or temperature	1,0 to 5 s
Analysis	10,0 s
Spare I/ O s	1,0 s
Digital control	< 1,0 s or „on demand”
Sequence control	from 1,0 s
Logic control	< 100 ms

9.12.1 The above list is applied to I / O s as well as to the control algorithms.

9.12.2 The following facilities are included in the DCS System:

- a) Operator stations with 2 monitors;
- b) Engineer station with 1 monitor;
- c) Port(s) for RS communication.

10. POWER SUPPLIES

DCS systems shall be powered from a minimum of two power supplies in a redundant configuration; each sized for full load. Failure of a single power supply due to loss of voltage or ability to support full load shall initiate a Priority 2 alarm. Field devices and related input modules shall also be powered from two power supplies, each sized for the full load, which may be the same essential power supplies as those that power the logic.

11. REAL ANALOG AND DIGITAL VARIABLES TAG NAMES

11.1 Introduction

11.1.1 In connection with larger and larger application of distributed control systems (DCS) and programmable logic controllers (PLC) and their integration into one information system in AB „ORLEN Lietuva” (OL), a revision of the analogue and digital real time tag names becomes necessary.

11.1.2 The files of these names are the basic component of DCS databases.

11.1.3 The strict correlation or even, if possible, identity between the tag names on the Piping & Instrumentation Diagrams (P&ID) and tag names in DCS and PLC database should be endeavored.

11.1.4 There is the clash of interest on this field. Tag names of analogue and digital real variables used in databases and graphics on monitors for DCS should be as short as possible and possibly most comprehensive (i.e. long) when used on P&IDs.

11.1.5 This elaboration attempts to achieve a compromise.

11.1.6 OL currently applies two labeling, marking and legend systems for P&ID.

11.1.7 Western Design Offices mainly apply ISA Standards:

ANSI/ISA - 5.1-2009

Instrumentation symbols and identification

ISA-S5.3 - 1983

Graphic symbols for distributed control / shared display instrumentation, logic and computer systems

11.1.8 Propositions herein contained in the subsequent part of this document are the adaptation of ISA Standards.

11.1.9 Instrumentation technical designs should include descriptions of the real variable (tag name) codes prepared as the “legend” basing on these guidelines. To avoid a diversity of meaning of the tag name symbols, the “legend” should be prepared in a very detailed manner. In doubtful cases ISA standards should be applied.

11.2 Format of Variables Names

Due to the fact that DCS systems will be connected to the company integrated information network, the information from individual plants will have to be distinguished and therefore the tag names should be specific ones.

Three following conventions (layers) can be distinguished when establishing the tag names:

P&I Drawings

Specific tag names for the process plant. Sub-dividing into sections preceded with suffixes can be applied in case of large and complicated plants.

DCS and PLC Systems

Tag names used for different production areas which more than once agglomerate few plants sometime also divided into process sections.

In this case the tag names have to be unique for the entire production area serviced by DCS or PLC. Special suffix (section number) should be foreseen for the respective plants / process sections.

PI – Real Time Database

It covers the whole company. The individual plants, areas and process sections must have the specific suffixes – plant codes and section numbers for proper identification.

The name of each variable in the respective layers should be coherent and possible for implementation. Below are presented the proposed naming formats for the loops:

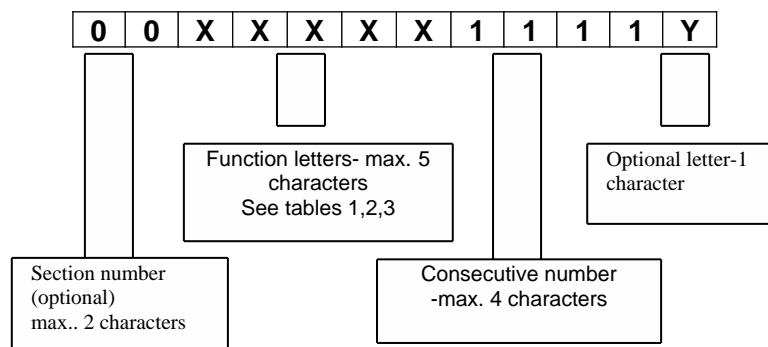


Figure 1. P&IDs Loop

Conversion from P&ID to the tag name in DCS should lead to maximum simplification of the letter part of the tag name (in most cases, a number of characters should not exceed 3). In particular, such functions as I-indication, R- registration, AL, AH, ALL, AHH- types of alarms for analogue variables should be omitted.

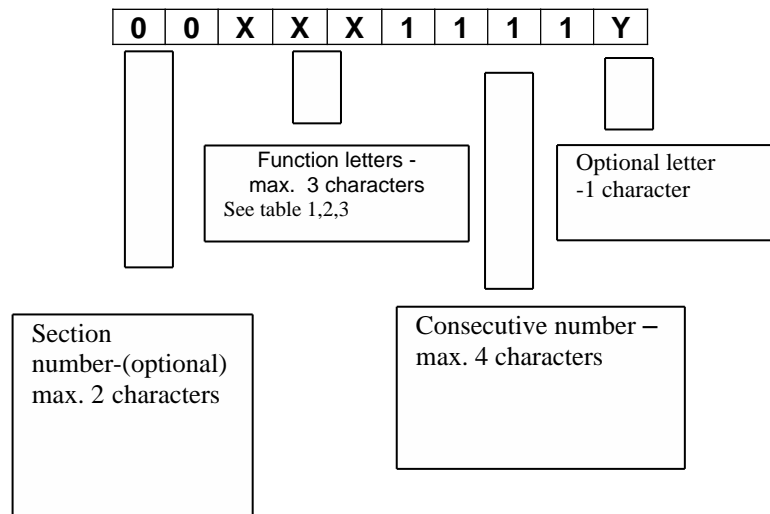


Figure 2. DCS and PLC Loop

Conversion of the tag name between base of DCS and PI consist in supplementation of the name in DCS with the prefix with the plant code DCS and suffix with the name of read-out variable.

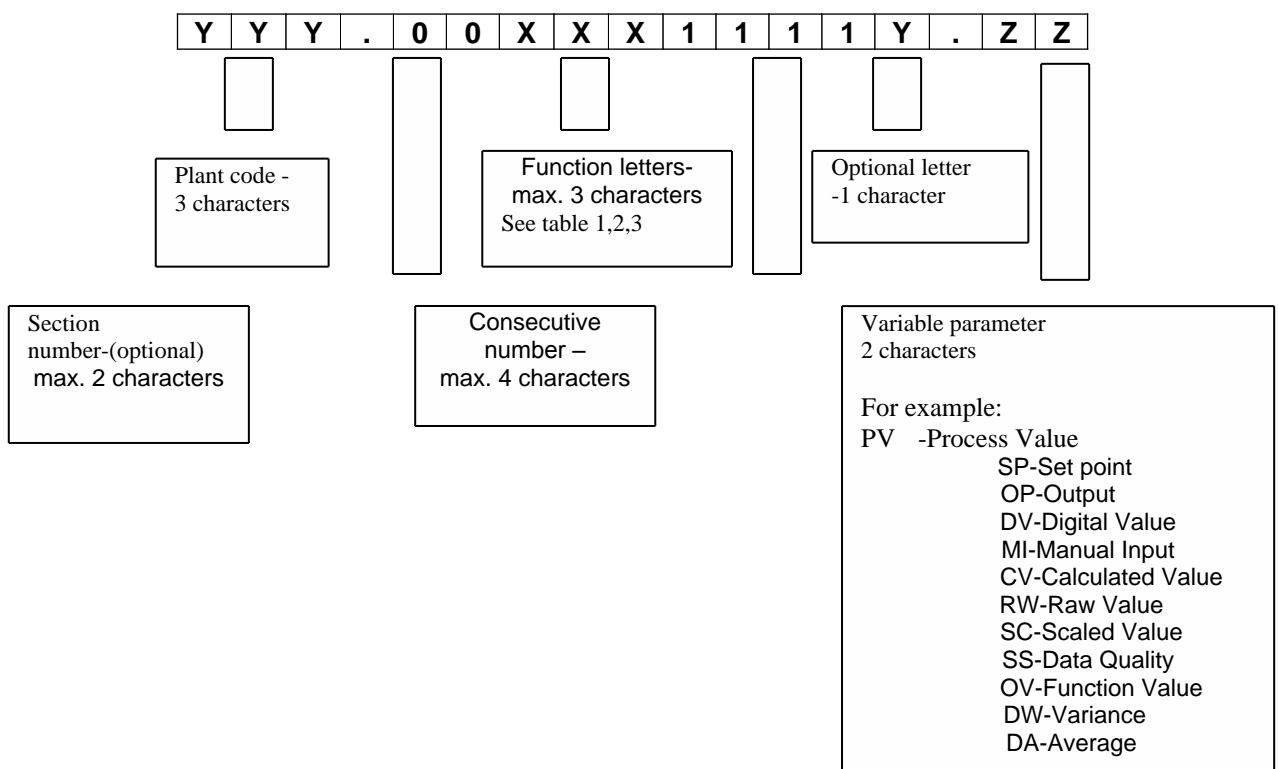


Figure 3. PI – Real Time Database Loop

11.3 Examples of Tag Names

Table 2. Examples of Real Variables and Their Conversion

Type	P&ID	DCS & PLC	PI Database
Pressure Indication with alarm	PIAH100	P100	INS.P100.PV
Temperature Control with alarms	TRCAHL1234	TC1234	INS.TC1234.PV INS.TC1234.SP INS.TC1234.OP
Flow Indication with totalizing	2FIQ100	2FQ100	INS.2FQ100.PV INS.2FQ100.CV
Manual Control with indication	1HIC1234	1HC1234	INS.1HC1234.OP
Differential pressure control with indication and alarm	PDICAL123	PDC123	INS.PDC123.PV INS.PDC123.SP INS.PDC123.OP
High Analysis alarm	AAH100	AAH100	INS.AAH100.DV
High analysis shutdown	ASHH100	ASH100	INS.ASH100.DV
Low pressure alarm	1PAL200	1PAL200	INS.1PAL200.DV
Low pressure shutdown	1PSLL200	1PSL200	INS.1PSL200.DV
High position alarm (e.g. Lever)	ZAH1234	ZAH1234	INS.ZAH1234.DV
Low position alarm (e.g. Lever)	ZAL1234	ZAL1234	INS.ZAL1234.DV
High displacement shutdown	ZSHH1234	ZSH1234	INS.ZSH1234.DV
High vibration alarm	1VAH123	1VAH123	INS.1VAH123.DV
High vibration shutdown	1VSHH123	1VSH123	INS.1VSH123.DV
Low temperature alarm	1TAL1234	1TAL1234	INS.1TAL1234.DV
Low temperature shutdown	1TSLL1234	1TSL1234	INS.1TSL1234.DV
High flow alarm	2FAH1234	2FAH1234	INS.2FAH1234.DV
High flow shutdown	2FSHH1234	2FSH1234	INS.2FSH1234.DV
Low speed alarm	SAL123	SAL123	INS.SAL123.DV
Low speed shutdown	SSLL123	SSL123	INS.SSL123.DV
Low level alarm	5LAL123	5LAL123	INS.5LAL123.DV
Low level shutdown	5LSLL123	5LSL123	INS.5LSL123.DV
No flame alarm	BAL1234	BAL1234	INS.BAL1234.DV
No flame shutdown	BSLL1234	BSL1234	INS.BSL1234.DV

Table 3. Examples of Machine and Device Tag Names

Type	P&ID	DCS & PLC	PI Database
ELECTRICAL			
Status of motor pump no 100: - Running - Available - Fail	MP100-P MP100-G MP100-A	MP100*	INS.MP100.DV
Permission for electrical motor pump No 1000	MP100-Z	MP100Z	INS.MP100Z.DV
Local / Remote switch status	MP100-L	MP100L	INS.MP100L.DV
Auto / Manual switch status	MP100-M	MP100M	INS.MP100M.DV
Remote Start of motor pump No 100	MP100-S	MP100S	INS.MP100S.DV
Remote Stop of motor pump No 100	MP100-W	MP100W	INS.MP100W.DV
Motor hours of motor pump No 100	MP100-K	MP100K	INS.MP100K.PV
Motor current of motor pump No 100	MP100-I	MP100I	INS.MP100I.PV
TURBINES			
Turbine driven pump No 100 – Running	1GP100-P	1GP100	INS.1GP100.DV
Power of Turbine / Compressor No 100	3GB100-J	3GB100J	INS.3GB100J.PV
MIXERS			
Mixer Motor No 100 – Running	2MM100-P	2MM100	INS.2MM100.DV
Permission for Mixer Motor No 100	2MM100-Z	2MM100Z	INS.2MM100Z.DV
FANS			
Fan Motor No 100 – Running	MW123-P	MW123P	INS.MW123.DV
Remote Start of Fan Motor No 100	MW123-S	MW123S	INS.MW123S.DV
SWITCHES AND PUSHBUTTONS			
Pushbutton (unstable type)	PB100	PB100	INS.PB100.DV
Hand Switch (bi-stable type)	HS100	HS100	INS.HS100.DV
OTHERS			
Electrical Heater No 100	EH100	EH100	INS.EH100.DV

* In DCS systems can be used Composite or Device – multi input

Table 4. Examples of Valve Tag Names

Type	Valve	Solenoid Valve	Limit Switch Close	Limit Switch Open
Flow valve	FV-100	FXY-100	FSC-100	FSO-100
Pressure valve	PV-100	PXY-100	PSC-100	PSO-100
Temperature valve	TV-100	TXY-100	TSC-100	TSO-100
Level valve	LV-100	LXY-100	LSC-100	LSO-100
Hand valve	HV-100	HXY-100	HSC-100	HSO-100
Interlock valve / Emergency shut OFF valve	XV-100	XY-100	ZSC-100	ZSO-100
Motor driven valve	MV-100		ZSC-100	ZSO-100

12. ASSETS MANAGEMENT SYSTEM

Assets Management System will enable secure access to instrumentation equipment like SMART transmitters, positioners and provide on line diagnostic and other service functions.

13. EXAMPLE OF SYSTEM ARCHITECTURE

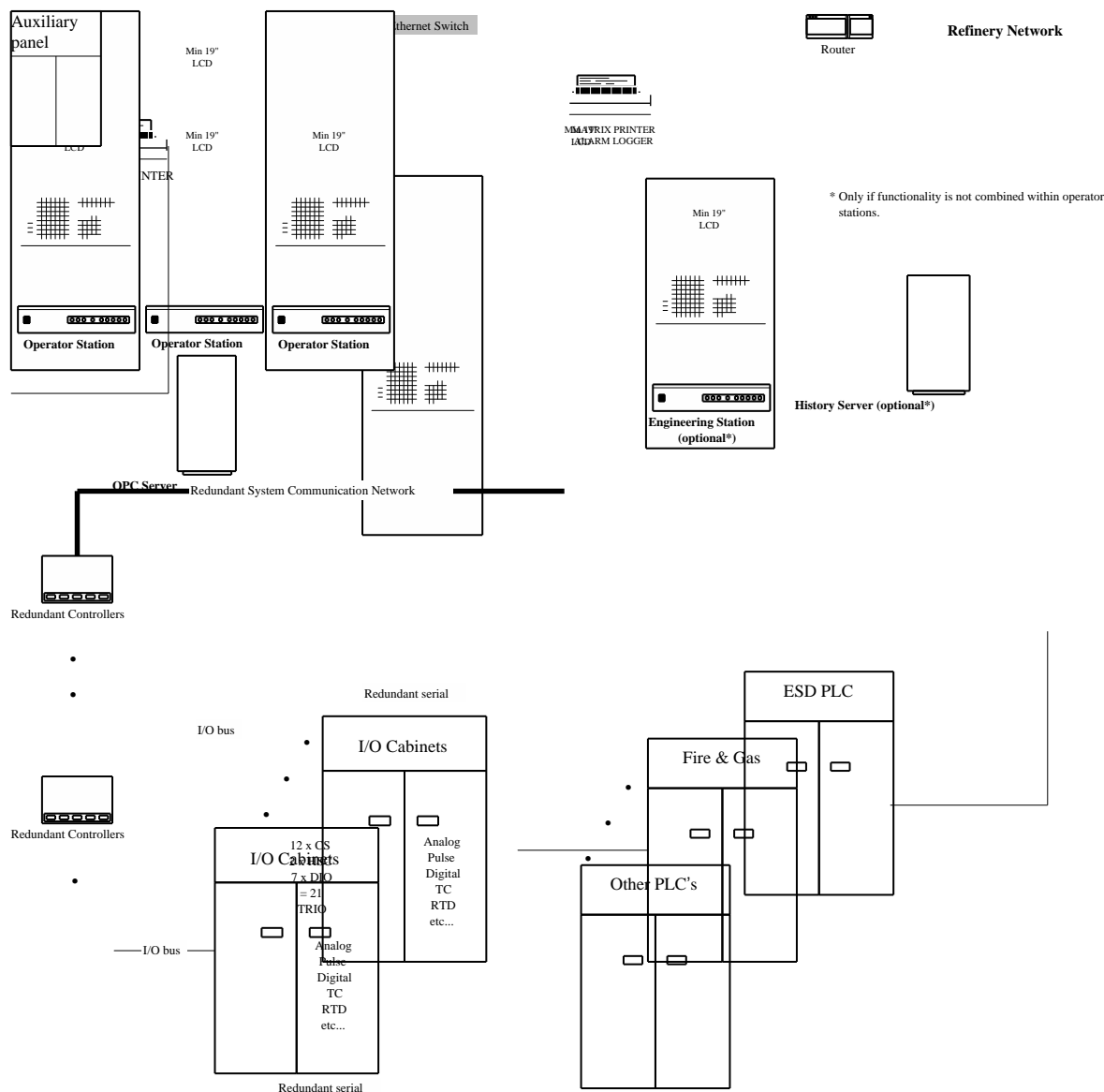


Figure 4. Example of System Architecture

14. DOCUMENTATION

Documentation provided with DCS/PLC systems shall, in addition to the requirements, include:

- Installation instructions.
- Systems integration drawing.
- Hardware manuals.
- Programming manuals.
- All programming language code, including comments needed to relate the program to the specification and explanations of programming techniques or shortcuts used.
- Input and output lists, including the input/output numbers, descriptions, and field wiring tag numbers.
- Two copies (total) of the program on loadable media such as a diskette.
- Recommended spare parts list.