Automation Stations (PLC/DDC Technology)

Specification

Contains adaptations to IEC 61346-2 – Industrial Systems, Installations and Equipment and Industrial Products – Structuring Principles and Reference Designations – Part 2: Classification of Objects and Codes for Classes (IEC 61346-2:2000); German Version EN 61346-2:2000

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1.1   PLC/DDC Sub-stations / Automation Systems

1.1.1 Structure of the PLC/DDC Technology

PLC/DDC systems must be used in which the PLC/DDC programs can be processed, downloaded and uploaded from the control room via the system bus (Up and Downloading). It must be possible to interface different PLC/DDC systems with different bus protocols simultaneously. The automation stations fulfil all automation and optimisation tasks independently and reliably by standardised function blocks for supply technology and other technical building installations. The modular software components from a standardised library can be freely combined and assigned the necessary operating parameters for the individual customer system depending on the requirements, e.g. for:

- ⇨ complex process controls
- ⇨ intermeshed control circuits
- ⇨ detection of alarms
- ⇨ local operation
- ⇨ energy saving optimisation functions
- ⇨ peer to peer communication
- ⇨ functions in accordance with ISO 16484

1.1.1.1 *Physical and Virtual Basic Functions*

- ⇨ switching
- ⇨ setting
- ⇨ signalling
- ⇨ measuring
- ⇨ counting

1.1.1.2 *Processing Functions*

- ⇨ self-monitoring

1.1.1.3 *Monitoring*

- ⇨ detection and processing of messages
- ⇨ limit value formation with measured values
- ⇨ counting value monitoring with limit value formation
- ⇨ command runtime monitoring/checking (monitoring of a switching or setting command)
- ⇨ message linking
- ⇨ suppression/hiding of a message
- ⇨ visualization of messages

1.1.1.4 *Control*

- ⇨ start-up control
- ⇨ motor control
- ⇨ follow-up circuit
- ⇨ safety circuit
- ⇨ frost protection circuit

1.1.1.5 Controllers

⇨ fixed value controllers (all PIDs)
⇨ follow-up controllers, cascade controllers, with and without disturbance variable connection (all PIDs)
⇨ limiting controllers (all PIDs)
⇨ heating controllers with PI control
⇨ heating controllers with PI - PID control

1.1.1.6 Computing and Optimisation

⇨ computed values
⇨ event switching
⇨ time switching
⇨ heating time optimization
⇨ ventilation time optimisation
⇨ cyclic switching
⇨ summer night cooling operation
⇨ cool-off protection
⇨ energy recovery
⇨ substitute mains operation
⇨ mains recovery program
⇨ heating curve adaptation
⇨ power consumption calculation
⇨ energy consumption calculation

1.1.1.7 Room Display/Operating Function of the Single Room Control

⇨ nominal value adjustment
⇨ absence/presence detection
⇨ operating status display
⇨ room temperature display

1.1.1.8 Processing Functions of the Single Room Control

⇨ operating mode control
⇨ controller characteristic switching
⇨ downdraught compensation
⇨ summer/winter compensation
⇨ rapid heating/rapid cooling
⇨ control of the primary system

1.1.2 Functions of the Automation Station (PLC/DDC Sub-station)

The task of the automation station (CPU) with microprocessor is the monitoring, control, regulation and optimisation of all connected information points.

1.1.3 Central Unit

This controls input/output modules and communication units.

The central unit must have the following components and features:

⇨ memory for the operating system, the basic processing routines and all system-specific programs and data
⇨ clock component
⇨ backup component for RAM and clock (at least 7 days)
⇨ interface for connecting a mobile HMI device
⇨ interface for connecting a mobile programming device (may be a common interface with the HMI device)
⇨ interface for manufacturer-specific communication
⇨ interface for manufacturer-neutral communication (LON, ETHERNET, PROFIBUS-DP, ..., data exchange via DA server to process control)
⇨ watchdog for self-monitoring
⇨ interfacing for peripheral modules

1.1.4 System-internal Messages Automation Units

All system-related signals and data points must be signalled and transmitted to the BCT in automation units:

⇨ module failure
⇨ communication failure
⇨ periphery failure (measuring ranges, wire breakage etc.)
⇨ fuse monitors automation unit
⇨ fuse monitors per module
⇨ voltage monitoring
⇨ main switch
⇨ acknowledgements
⇨ program errors
⇨ start-up faults
⇨ system errors

1.1.5 Communication Automation Stations

The following must be observed with regard to communication:

⇨ Failure of a communication user may not lead to a failure of faults in other users.
⇨ Failure of a communication user may not lead to a failure or fault in the total communication.
⇨ The communication unit includes a fine overvoltage protection for installation between the communication lines.
⇨ The communication network must be configurable in RING, STAR and LINE STRUCTURE. Intermeshing of the different structures must be possible.
⇨ The communication unit must ensure data transmission over a distance of 2,000 m. This applies both to an end user and an intermediate user. Any necessary repeaters are included in the scope of delivery of the automation unit.

1.1.6 Notes on Sub-assemblies

The following must be observed for sub-assemblies:

- ⇨ All sub-assemblies must be labelled cleanly and legibly.
- ⇨ The sub-assemblies must be easy to exchange for service reasons (whole connection by plug-in unit)
- ⇨ All connections are made by screw or plug connectors (CLAMP). Soldered or crimp connections are not permissible.
- ⇨ All connections must be easily accessible.
- ⇨ All sub-assemblies must be short-circuit-proof or must have their own fuses in the direction of the connected signals. For sub-assemblies without this protection, fuse terminals with fine wire fuses must be installed (to be included in the calculation for sub-assemblies).

1.1.7 Reserves

The following reserves must be observed in the design and taken into consideration in the design plans:

PLC/DDC

- ⇨ control cabinet 3o% for total expansion DDC sub-station with all sub-assemblies and components
- ⇨ memory capacity reserve sub-station 2o%
- ⇨ program reserve sub-station 2o%
- ⇨ plug slot reserve sub-assemblies 2o% but at least 3 sub-assemblies

reserve on existing sub-assemblies 2o% per sub-assembly type or sub-assembly
If changes occur in the course of the design which lead to a reduction in the reserve, these must be agreed with the customer.

1.1.8 Power Fail Safety

In case of mains voltage recovery after power failures, the affected automation stations (PLC/DDC sub-stations) must continue full operation automatically without the necessity for re-entering programs or parameters or other activities. Start-up routines must ensure that all programs are acknowledged and the connected systems can restart. The parameters of the systems must be maintained in the last state before power failure. Automatic message suppression takes place in the automation unit in the event of a power failure or after mains recovery. Only the necessary messages may be switched through to the process control.

Power failures in automation units (PLC/DDC sub-stations, electronic terminal blocks, distributed I/O, etc.) must be detected and displayed centrally as a fault or danger message. A power failure in an automation station may not lead to failure of other automation units or failure of the system or data network.

The programs and data as well as all other parameters must remain saved in case of a power failure (for at least 30 days). After power recovery the programs must continue in the last operating state before the power failure unless restart routines are specified. In order to ensure the functioning of time-dependent switching programs after power recovery, the system-internal clock must also continue to run. Safety-oriented sub-stations (cold, heating, electrical, etc.) must be equipped with a UPS and an AV_SV switching. There is a delayed switch back to AV (15 s).

1.1.9 System Switching Command

The system switching command is a system command which is available both in the BCT and in the sub-station. Only switching actions take place in the BCT. The sub-station takes over all the functions such as start-up and shut-down operation.

Area of application system switching, e.g.:

- ⇨ ventilation technology
- ⇨ air-conditioning technology
- ⇨ heating technology
- ⇨ cooling technology
- ⇨ electrical technology
- ⇨ various units

Functional description

The system can be switched out of or into one of the switching stages with the system switching command. The maximum number of switching stages can be parameterised. The system switching command can be switched by time switching programs or other function programs (see function items in accordance with ISO 16484) in the automatic or BCT modes.

A start-up sequence is activated after switching on the system. The sequence begins with the first start-up stage. The system does not switch to the next start-up stage until the first one has ended. At least 7 start-up stages are available. Therefore all common start-up switchings are possible in systems.

> Example:
> Stage 1 = > purge time for start-up operation
> Stage 2 => open flaps
> Stage 3 => switch on supply fan
> Stage 4 => switch on exhaust fan
> Stage 5 => enable temperature control
> Stage 6 => enable humidity control
> Stage 7 => enable after-treatment zones

The start-up stages must be defined in every system. Every stage can be released by individual criteria. Shut-down routines can also be set up according to the application.

System fault switch-off

A system fault switch-off effects forced switch-off of the system switching command. This aborts all start-up processes and switches off the system (the main and sub-units are usually switched off). The system fault switch-off has a locking effect, i.e. the system cannot be switched back on until the fault has been eliminated and the system unlocked.

Locking the system

The system can be unlocked after eliminating faults by an acknowledgement key on the control cabinet or by the BCT.

Supression of message cascades

So-called "MESSAGE CASCADES" may occur in various fault states. Message cascades in this case are an accumulation of messages due to the initial fault. An accumulation of messages occurs in the following cases:

SYSTEM

⇨ power failure
⇨ control voltage fault
⇨ trigger main switch
⇨ switch off main switch

UNITS

⇨ supply fan fault
⇨ exhaust fan fault
⇨ supply and media systems fault

Message cascades are suppressed in the system:

⇨ detection of the first message
⇨ barring of all resulting consequential messages

Mains recovery (fault unlocking)

The systems do not generally run through a defined shut-down process with mains failure or switching off by circuit breakers or control fuses. Appropriate messages may appear. These are acknowledged automatically when power is recovered. This ensures fault-free start-up of the systems.

⇨ mains recovery
⇨ switch to safe operating state
⇨ acknowledgement of the systems
⇨ start-up of the systems

1.2 Operation

1.2.1 Operating Levels

Four different hierarchical levels are identified in the systems controlled and regulated by the PLC/DDC:

⇨ emergency operation
⇨ manual operation
⇨ automatic operation
⇨ BCT operation

1.2.1.1 *Emergency Operation*

Here the system is controlled by the operating personnel by means of external switches and/or nominal value actuators. The controller is not active in emergency operation.

1.2.1.2 Manual Operation, OU

Control of the system through the automation unit. The operating mode is determined by inputs on the manual operating unit or the operating unit on the PLC/DDC sub-station. Every system, every switching command, setting command, etc. can be switched or driven manually by the operating unit independently of the PLC/DDC. Any switching points of timing programs for the selected unit during this mode of operation are traced after manual return to automatic operation.

1.2.1.3 Automatic Operation

Here the system is controlled and regulated by the automation unit/PLC/DDC sub-station. All switching actions run according to the fixed or set parameters. The system operator only has to intervene in case of faults in the system. All units should be in this mode for optimum system operation. Only controller nominal values and system switching commands are operated by the BCT (next operating mode) in well set systems.

1.2.1.4 BCT Operation

Here the system is controlled and regulated by the building control technology (BCT). All switching actions in this operating mode are directly subordinate to supervision or programming by the operating personnel. The system switching commands and the controller nominal values should basically be in this operating mode. All the units can be switched into this operating mode for special applications or function testing.

The following management functions are performed by the BCT:

- ⇨ system switching
- ⇨ timing plans
- ⇨ event switching plans
- ⇨ special programs
- ⇨ records
- ⇨ curves
- ⇨ archives
- ⇨ faults
- ⇨ system optimisation
- ⇨ fault recording and any processing
- ⇨ maintenance program
- ⇨ peak load management
- ⇨ archiving programs
- ⇨ links to building management systems

1.2.2 Operating Concept BCT/PLC/DDC/Operating Units

The operating concept is an application-optimised, menu-guided regulation, control and monitoring system. The operating menu appears automatically when plugging the operating unit to the automation unit. A menu-guided operation of the unit with the appropriate key panel is ensured on activation. The following switching are possible in the systems or units as well as in operating applications (timing program, controller, etc.):

- ⇨ MANUAL
- ⇨ AUTOMATIC
- ⇨ BCT

When operating the selected system on an emergency operating level, this is displayed by "local" (LOC). Exception: control valves of which the pneumatic control units have no message about their switching state. All characteristics, value ranges, dimensions and times are displayed in the correct units. The status texts for messages, switching commands etc. can be adapted exactly to the requirements. A fault is identified by a graphic display and can be localised by menu control.

The current date and time are always displayed when the automation unit is operated with a clock module.

1.2.2.1 System Processing

All the systems of the automation unit are displayed in the selection menu. Every system is completely switchable and can be selected with its operating equipment/units.

1.2.2.2 Messages

All the necessary items of information of the corresponding messages are stored:

- ⇨ status (on, off, active ...)
- ⇨ type (fault, danger, ...)
- ⇨ description(frost protection, filter, V-belt, pressure ...)

Apart from messages about digital inputs, internal messages of the process can also be formed. Five types of messages are distinguished:

Operating message:

- ⇨ Status display of a unit, e.g.: ON/OFF
- ⇨ Processing: operating current principle
- ⇨ Display: no display at a message lamp
- ⇨ Effect: none

Maintenance message:

- ⇨ Maintenance message of a unit, e.g.: filter - MAINT
- ⇨ Processing: quiescent current principle
- ⇨ Display: slow flashing of fault lamp
- ⇨ steady lighting after acknowledgement;
- ⇨ lamp off after fault elimination.
- ⇨ Effect: system is not switched off in case of a maintenance message
- ⇨ Switching over to the reserve unit possible (e.g. dirt trap)

Fault message:

- ⇨ Fault in a unit, e.g.: pump - FLT
- ⇨ Processing: quiescent current principle
- ⇨ Display: fast flashing of the fault lamp
- ⇨ steady lighting after acknowledgement;
- ⇨ lamp off after eliminating the fault
  Effect: depending on parameterisation Examples:
- ⇨ Fault steam humidifier: no switch-off;
- ⇨ Repair switch fan: switch-off.

Danger message without switch off:

- ⇨ Fault in a unit, e.g.: fan of sub-systems
- ⇨ Processing: quiescent current principle
- ⇨ Display: fast flashing of the fault lamp
- ⇨ steady lighting after acknowledgement;
- ⇨ lamp off after fault elimination
- ⇨ Effect: system is not switched off when this danger message appears

Danger message with switch-off:

- ⇨ Fault in a unit, e.g.: fire protection flap in "main channels"
- ⇨ Processing: quiescent current principle
- ⇨ Display: fast flashing of the fault lamp
- ⇨ steady lighting after acknowledgement;
- ⇨ lamp off after eliminating the fault
- ⇨ Effect: system is switched off when this danger message appears.

1.2.2.3 Switching Commands

Technological function blocks can be started using the switching command user interface. These function blocks switch individual units, system parts or whole systems according to the structuring. The current switching statuses are displayed. Several stages or one stage only (1 from n lock) can be switched simultaneously depending on the structuring. Two switching types are distinguished:

- ⇨ **step – controlled drives**
- ⇨ **uncontrolled drives**

In step – controlled drives, hysteresis, time intervals and the switching distance between the stages can be optimised by the operating unit or the BCT.

1.2.2.4 Setting Commands

All continuously controlled and controlled actuators can be driven by the operating unit. The following variables are adapted to the process:

- ⇨ **upper limit (maximum position)**
- ⇨ **lower limit (minimum position)**
- ⇨ **steepness (adaptation to the controller output)**

The momentary position in 0-100% is displayed.

1.2.2.5 *Measured Value Processing*

The measured values are generally processed by characteristics. Limit value monitoring and wire break checking are also performed. Occurrence of an error outputs a fault message. The measured value is adapted exactly according to sensor or transducer requirements. The relevant upper and/or lower limit values in the automation unit can be operated and monitored by the operating unit. Another pair of limit values is set by the BCT as a warning limit.

1.2.2.6 *Controller*

A total controller circuit diagram is available for the controller. The following parameters can be monitored or operated:

- ⇨ actual value
- ⇨ nominal value (nominal value adapted by nominal value shift)
- ⇨ basic nominal value (adjustable)
- ⇨ manual (the whole controller sequence can be run and stopped by function keys)
- ⇨ upper and lower limit values of a follow-up controller (cascade, adjustable)
- ⇨ Kp of the follow-up controller
- ⇨ complete sequence list (all actuators of the controller with their position feedback and operating state)
- ⇨ Kp, Tn and Tv of the command controller (adjustable)
- ⇨ nominal value connection (e.g. summer compensation; complete characteristic is adjustable). All the parameters output on the controller are displayed physically and unit correctly.

1.2.3 Communication with the Process Control

The supplier must provide a driver (Wonderware DA, DI, OPC, DDE) or suite link for connecting the control processor for the PLC/DDC technology. An update rate of the data points from the field level to the I/O server of a maximum 5 seconds must be guaranteed.

All data points of the automation station must be projected in this I/O server. The transfer file specified in 3 must be supplied as an interface and be generated automatically if possible to avoid errors. The easiest way to do this is to use the SIK (system identification key; GIS general identification system) described below already in the programming of the automation stations.

All data points must have an easily comprehensible comment attached which allows the operating personnel to assign them unambiguously. The system assignment must be clear from the text because a distinction must be made between different properties and buildings in the process control or in fault message centres. This clear text is also used for remote alarming by text message (SMS)/fax/e-mail or voicemail.

> e. g.: House5 DG \RLT031RLT02/supply fan/motor protection triggered

2 General Identification System (GIS)

2.1 Goals of the GIS – General Identification System

The General Identification System (GIS) takes over the central job of establishing a clear connection between all management-relevant objects and documents. This is a linking between the real systems and the graphical and alphanumerical data (paper form and/or digitalised). The GIS designation is at the same time the designation of the data point in the DDC/PLC or the BCT.

2.2 Requirements for the SIK

The SIK may only be assigned once. All the places of the SI-key must be assigned up to the described level. Unused places, especially the consecutive numbering of the systems, sub-assemblies and data points may have to be filled up by "_" (underscore).

The system identification key must be used as a name for all resources (flags, I/O, registers). The SIK must be unique for all systems for this object.

The SIK must be used in the programming (either as a logic name or prefixed to the description)!

2.3 Structure of the SIK

The SIK consists of 10 levels with a total of 28 places. The levels 1 (country code) and 2 (city code) are defined differently for different properties and must be requested from the customer before starting the building measure. This level is supplemented in the management level; because the PLC programming is determined locally, the 3rd level can begin with assignment of the logic name.

Example: USA836RESO1431001G030-01ES01

	Country-code	Real-estate-code.	Build-ing	Storey	cost-group	Plant number	Resource ID-serial	Measured/ Initiatory Var.	Functions code	serial
Place	1-3	4-6	7-9	10-11	12-14	15-17	18-24	25	26	27-28
Example	USA	836	RES	O1	431	001	G030-01	E	S	01

⇨ USA   : Deutschland
⇨ 836   : Washington
⇨ RES   : Residence
⇨ O1   : 1st floor
⇨ 431   : cost group / subsection - air-handling system
⇨ 001   : Plant number (in single room controller also room number)
⇨ G030.01: motor air-conditioning convector, serial 01
⇨ E   : electrical
⇨ S   : switching command
⇨ 01   : low speed or serial

Catalogues of the designations and rules for application are listed below
11th floor Obergeschoss

2.3.1 1st to 3rd Level (Countries/City/Building Identification), Place 1-9

The building designation is specified by the customer.

2.3.2 4th Level (Storey Identification), Places 10 and 11

10th - 11th place	Storey designation	10th - 11th place	Storey designation
U3	Basement 3rd	10	10th floor
U2	Basement 2nd	11	11th floor
U1	Basement 1th	12	12th floor
GF	Ground floor	13	13th floor
O1	1th floor	14	14th floor
O2	2nd floor	15	15th floor
O3	3rd floor	16	16th floor
O4	4th floor	17	17th floor
O5	5th floor	18	18th floor
O6	6th floor	DG	attic floor
O7	7th floor	AU	Outside
O8	8th floor		
O9	9th floor		

2.3.3 5th Level (Cost Group, Unit Identification), Places 12 to 14

The unit identification corresponds to the assignment of the systems according to the costs groups 300 (Building Designs) and 400 (Technical Installations): within buildings as well as the cost group 500 (External Technical Installations).

12th-14th place	Description
334	Outside doors and windows
338	Sun protection
344	Inside doors and windows
362	Roof lights, roof openings
411	sewage systems
412	Waste water systems
413	Gas systems
419	sewage, water, gas systems, others
421	Heat generating system
422	Heat distribution networks
423	Room heating surfaces
429	Heat supply systems, others
431	Ventilation systems
432	Partial air-conditioning units
433	Air-conditioning unit
434	Cooling systems
439	Air systems, others
441	High and medium voltage systems
442	Generator,photovoltaics
443	Low voltage switching systems
444	Low voltage installation systems
445	Lighting systems

12th-14th place	Description
446	Lightning protection and earthing systems
449	High voltage systems, others
451	Telecommunications systems
452	Search and signal systems
453	Time service systems
454	Electro-acoustic systems
455	TV and aerial systems
456	Danger message, alarm systems
457	Transmission networks
459	Telecommunications, information technical systems, others
461	Lift system
462	Escalators, moving pavements
463	Drive ways
464	Transport systems
465	Crane systems
469	Conveyor systems, others
471	Kitchen systems
472	Laundry and cleaning systems
473	Media supply systems
474	Medical and laboratory systems
475	Fire extinguisher systems
476	Bathing systems
477	Process heat, cold and ventilation systems
478	Disposal systems
479	Utilisation-specific systems
481	Automation systems
482	Control cabinets
483	Management- and operating devices
484	Room automation systems
485	Transmission networks
489	Building automation, others
531	Enclosures (doors, gates, barrier systems)
541	Waste water systems
542	Water systems
543	Gas systems
544	Heat supply systems
545	Air supply systems
546	High voltage systems
547	Telecommunications and information technical systems
548	Utilisation-specific systems
549	Technical systems in outdoor areas, others

2.3.4 6th Level (System Number), 15th to 17th Places

Serial number of the plant

2.3.5 7th Level (Operating Equipment Identification), 18th to 24th Places

The operating equipment identification occupies 7 places. It starts with a letter followed by 3 digits (operating equipment) a minus and 2 digits (consecutive numbering).

The operating equipment identification is based on IEC 61346-2. It is structured according to operating equipment of the EMSR technology. Every operating equipment has a fixed identification. The function is defined by the identification. If several operating equipments with the same function exist within a system, they are distinguished by indexing.

- B001.01 = > room temperature sensor 1 of the system
- B001-02 => room temperature sensor 2 of the system
- B001-.0n => room temperature sensor n of the system

If operating equipment exists which does not fit into the structuring, the operating equipment identifications must be agreed directly with the customer.

2.3.5.1 A   General (Two or More Purposes or Tasks)

("systems which are a self-enclosed unit", e.g. lift, pressure increase)

ID	Operating equipment	ID	Operating equipment
A001	Lift	A064	Concrete core tempering
A002	Fire service lift	A065	tempering Room convectors
A003	Facade lift	A066	Kitchen equipment (e.g. sink)
A004	File conveyor system	A067	Sanitary
A005	Crockery conveyor system	A068	Central acknnowledgement BCT
A006	Moving pavements, escalators	A069	Fan convector
A007	Other conveyor systems	A07o	Pressure increase system
A008	Gas supply	A071	Pressure holding system
A009	Fire alarm technology	A072	Control with diaphragm unit and container
A010	CO2 extinguisher system	A073	Road systems
A011	Argon extinguisher system	A074	Signposts
A012	Inergen extinguisher system	A075	Signal systems
A013	Compressed air system	A076	Plants / lawns
A014	Fire curtain	A077	Water
A015	Fire protection gates/doors	A078	Parking (barriers, rollover gates…)
A016	Downdraught devices	A079	Cooling machines
A018	Induction devices	A080	Air-conditioning unit
A022	Air deflection unit (e.g. HESCO)	A081	Cooling tower
A023	System switching command	A082	Desalination and quality devices water
A024	Switching heating/cooling	A083	Pump dosing system
A025	Heating operation	A084	UV disinfection
A026	Total system (group fault)	A085	Condensation lifting system
A027	Pneumatics	A086	Softening double system
A028	Wet waste	A087	Grease separator
A029	Paper	A088	Hydrant display panel
A030	Climate convector or other control components for single room controllers	A090	Sprinkler monitoring system
A031	Ceiling/circulating air units	A091	Vacuum drainage system
A032	Waste	A092	High performance biology
A033	Special waste	A093	Biological grey water treatment plant

ID	Operating equipment	ID	Operating equipment
A034	Kitchen waste	A094	Suction extractor
A035	CO controller	A095	Immersion pump
A036	Locking systems	A096	Receiver units
A037	Dirty water treatment	A097	Office equipment
A038	Gas monitoring	A098	Social facility
A039	Gas warning system	A099	Free system
A040	Compressed air	A101	10kV network
A041	Oxygen	A102	AV network
A042	Safe	A103	SV network
A043	Tank systems	A107	Emergency power systems
A044	Lifting systems	A117	Electrical (subdistributors, lighting control, ...)
A045	Swimming baths	A121	Burglary protection, building surveillance
A046	Water treatment	A122	Sun protection
A047	Water supply system	A140	Communication system
A048	Rain water utilisation	A142	Telephone system
A049	Sprinkler system	A144	Time recording
A050	Remote heat supply	A146	Clock systems
A051	Heat exchanger	A148	Paging/intercom system
A052	Heating boiler	A150	Fire alarm centre
A053	Block type heating power station	A151	Call relaying exchange
A054	Heat pump	A152	Early warning systems
A055	Message/control module fire protection flap system / Distributed periphery	A170	Burglary alarm centre
A056	Operating device fire protection (e.g.. Ansul ext. system) sprinkler	A171	Escape route centre
A057	Fire service / smoke evacuation panel	A172	Central exchange
A058	Air-conditioning cabinet	A175	Disabled emergency call
A059	Electric heating, pipe heating (switching /control box)	A185	Central exchange
A060	Door air curtain systems	A190	Radio systems
A061	Static heating	A191	TV systems
A062	Underfloor heating system	A192	Media devices
A063	Facade heating	A194	Lightning protection/potential equalisation

B   Converter

(Transformation of an input variable (physical property, status or event) into a signal intended for further processing)

ID	Operating equipment	ID	Operating equipment
B001	Room temperature sensor	B074	Transformer inlet temperature secondary
B002	Supply air temperature sensor	B075	Rain sensor
B003	Exhaust air temperature sensor	B076	Wind sensor
B004	Outside air temperature sensor	B077	Condensation temperature
B005	Thermostat/application sensor	B078	Temperature blowdown (water, condensation)
B006	Dewpoint temperature sensor	B079	Pre-collector temperature
B007	Outgoing air temperature sensor	B080	Return collector temperature
B008	Mixed air temperature sensor	B081	Supply temperature cooling water
B009	Supply temperature sensor	B082	Return temperature cooling water
B010	Return temperature sensor	B086	Supply temperature cold water
B011	Room humidity sensor	B087	Return temperature cold water
B012	Supply air humidity sensor	B088	Spray water temperature
B0133	Exhaust air humidity sensor	B090	Differential pressure cold water
B014	External humidity sensor	B091	Differential pressure transducer (flow meter)
B015	Pipe thermometer	B095	Conductance measurement
B016	Pressure gauge	B096	Lack of compressed air
B017	Outgoing air humidity sensor	B097	Quantity counter (heat quantity, water quantity, .)
B018	Humidity sensor cooling ceiling	B098	Leak warning device
B019	Volume flow sensor medium air	B099	Height/level measurement(level switch)
B020	Diff. pressure room air (msd value)	B112	Light sensor
B021	Diff. pressure supply air (msd value)	B113	Presence indicator
B022	Diff. pressure ex. air (msd value)	B115	LON switch lighting
B023	Diff. pressure medium water (transducer)	B116	LON dim lighting
B025	Pressure pressostat	B118	LON dim general
B026	Pressure transducer (water)	B119	LON multi-unit
B027	Filter monitor supply air (analogue value)	B150	Smoke detector (optical)
B028	Filter monitor exhaust air (analogue value)	B151	Heat alarm
B029	Room temperature sensor / Nom. value act. for single room contr.	B152	Button indicator
B03o	Air quality room (measured value)	B153	Transponder
B031	Conductivity sensor general	B154	Smoke suction system
B032	Air quality exhaust air (msd value)	B170	Magnetic contact
B033	Presence indicator	B171	Locking plate contact
B034	CO2 sensor, CO sensor, air quality sensor	B172	Airborne noise indicator

ID	Operating equipment	ID	Operating equipment
B035	Temperature sensor HR (water)	B173	Alarm wire glass
B036	Pressure measurement gas	B174	Attack alarm
B037	Brightness measurement	B175	IR motion sensor
B040	Air temperature after pre-heater (not supply temp.)	B176	Banknote contact
B043	Exhaust air enthalpy	B178	Light barrier
B044	Outside air enthalpy	B180	Camera
B045	Pipe thermostat (control)	B181	Camera weather protection
B053	Smoke alarm supply air	B182	Camera with IR indicator
B054	Smoke alarm exhaust air	B183	Intercom emergency call
B059	Sensor pipe heater (socket and heating element)	B184	Intercom video
B060	Cold water mixing temp. supply	B185	Desk intercom
B061	Cold water mixing temp. Return	B186	Desk intercom video
B070	Transformer inlet temp. primary	B187	Magnetic contact
B071	Transformer outlet temp. primary	B188	Access reader
B072	Transformer outlet temp. secondary	B192	Terminating aerial
B073	Temperature buffer store	B195	OMNI aerial

2.3.5.2 C Stores

(storage of material, energy or information)

ID	Operating equipment	ID	Operating equipment
C003	Battery system	C030	Sludge collection tank
C004	UPS for MV/LV	C031	Self-emptying waste water tank
C005	UPS for EDP	C040	Hot water storage tank
C009	Filling tank	C079	Ice tank
C010	Stowage container	C080	Raised store
CO20	Diaphragm pressure tank	C092	Feed tank biology, -Rain water utilisation, -filtration
CO22	Expansion vessel		

2.3.5.3 E Energy Transmission

(provision of radiation or heat energy)

ID	Operating equipment	ID	Operating equipment
E001	Glass barrel sprinkler	E022	Hot water storage tank
E008	OFFICE lighting	E023	Small hot water tank
E009	Gas burner	E029	Cooling ceiling
E010	Electric heater channel	E050	Heating wall
E011	Steam humidifier	E051	Static radiator
E012	Steam humidifier	E052	Underfloor convectors

ID	Operating equipment	ID	Operating equipment
E013	Washer	E054	Underfloor heating
E014	Cold steam humidifier	E055	Facade heating
E015	Spray humidifier	E056	Concrete core heating
E016	Emergency lighting	E057	Room convectors
E017	Safety lighting	E059	Plate heat exchanger
E019	Electric heater room	E060	Pipe heater
E020	Hot water	E061	Pipe heater with self-regulating heating band
E021	Flow heater	E070	Hot water heater

2.3.5.4 *F Protective Device*

(direct (self-actuated) protection of an energy or signal flow of personnel or devices against dangerous or undesirable conditions, including systems and equipment for protection purposes)

ID	Operating equipment	ID	Operating equipment
F001	Frost protection thermostat medium air	F051	Differential pressure switch filter supply air
F002	Frost protection thermostat medium air recuperative HR	F052	Differential pressure switch filter exhaust air
F003	Frost protection control unit	F053	Fire protection hatch SUPPLY AIR
F005	Frost protection thermostat medium Water	F054	Fire protection hatch EXHAUST AIR
F006	Safety temperature limiter air	F055	Smoke extraction flap with actuator
F008	Fire bulkhead	F056	Safety thermostat / trigger device BM/ER
F009	Filling level monitor	F058	Sensor pipe heater
F010	Differential pressure switch supply fan (flow)	F059	Safety valve
F011	Wind vane relay supply air (air flow)	F060	Full stroke spring safety valve
F012	Speed monitor supply fan	F061	Thermal shut-off protection
F013	Pressure monitor MIN/MAX supply air channel	F062	Water shortage protection
F015	Safety device sun protection/Blinds	F064	Air vessel
F016	Fire extinguisher	F065	Expansion vessel
F017	Sprinkler head	F07o	Safety temperature limiter water
F018	Wall hydrant	F071	Water indicator
F020	Diff. pressure switch exhaust fan	F072	Max. safety pressure limiter
F021	Wind vane relay exhaust air	F073	Min. safety pressure limiter
F022	Speed monitor exhaust fan	F074	Maximum limit thermostat
F023	Pressure monitor MIN/MAX Exhaust air channel	F075	Temperature monitor
F026	Dry running protection pump, system, etc.	F076	Rain monitor (switching)
F030	Differential pressure via humidifier	F077	Wind monitor (switching)

ID	Operating equipment	ID	Operating equipment
F040	Maximum limit humidity	F081	Cooling tower fan (V-belt monitor)
Fo44	Pipe thermostat (STB)	F083	Thermostat cooling tower / flow monitor cooling water
Fo45	Pipe thermostat (safety)	F090	Flow monitor cold water
Fo47	Diff. pressure switch filter medium water	F091	Flow monitor cooling water
Fo48	Flow indicator	F092	Dry running protection cooling tower
Fo5o	Diff. pressure switch filter (general / air)	F093	Pipe cutter

2.3.5.5 *G Energy and Material Transport*

(initiation of an energy or material flow. Creation of signals which are used as information carriers or reference source. Production of a new type or a product)

ID	Operating equipment	ID	Operating equipment
G004	Shut-off valve supply air	G060	Shut-off valves cold water mixing temperature
G005	Shut-off valve exhaust air	Go62	refeeding pumps
G006	Blind flap supply air	G071	Supply pump transformer primary
G007	Blind valve exhaust air	G072	Supply pump transformer secondary
G010	Supply air fan	G073	Pump heating boiler
G013	Drive rotation heat exchanger	G076	Shut-off flaps transformer primary
G015	Blind motor, sun protection motor	G077	Shut-off flaps transformer secondary
G020	Exhaust air fan	G078	Supply pumps consumers general
G030	Motor air-cond. convector (e.g. in single room control) / Circulating air fans	G079	Switching valves/flaps HEATING <=> COOLING
G031	Drive blind, sun protection	G080	Spray pump (cooling tower)
G036	Pump recuperative HR	G081	Cooling tower fan
G037	Valves gas	G082	Shut-off valve (cooling water)
G040	Pre-heater pump	G083	Cooling water pump
G041	Post-heater pump	G085	Cooling machine (motor)
G050	Humidifier pump	G086	Cold water pump
G051	Shut-off valve heating	G087	Process cold water pump
G052	Heating circulation pump	G088	Shut-off valve cold water
G053	Actuator FPC (smoke extraction, fire service circuits)	G089	Supply pumps cold water
G054	Actuator smoke extraction windows/openings	G095	Pump condensation system
G055	Circulation pump	G097	HR filling pump
G056	Hand diaphragm pump	G098	Window drives
G057	Pressure holding pump	G099	Pump lifting system
G058	Sprinkler pump		

2.3.5.6 *K Signal and Information Processing*

(processing (reception, processing and provision) of signals or information (with the exception of) objects for protection purposes, see letter F)

ID	Operating equipment	ID	Operating equipment
K001	Automation station	K062	Switch
K002	Extension unit Automation station	K063	Network user
K003	Distributed I/O (e.g. ET100)	K064	HOST
K004	Internal modules (MSR / DDC)	K065	Wet alarm valve stations
K005	Local input/output module DDC (electronic terminal block)	K066	Valve limit switch kit
K006	Control module blinds, pulse transm. sun protection	K067	Zone check fitting
K007	Contact device	K068	Amplifier
K009	System computer/computer link	K069	System computer/computer link
K010	Pre-heater valve	K071	Heat exchanger control valve primary (transformer) (also for cooling machine)
K011	Post-heater valve	K072	Heat exchanger control valve secondary (transformer)
K015	LON switching lighting	K073	Addressing element 2E
K016	LON dimming lighting	K074	Addressing element 4E
K017	LON switching general	K077	Heat exchanger shut-off valve primary (transformer) steam (also for cooling machine)
K018	LON dimming general	K078	Heat exchanger shut-off valve secondary (transformer) steam
K019	LON multi-unit	K079	Control valve heating distribution
K020	Cooler valve	K080	Bypass valve cold
K036	Recuperative HR control valve	K081	Shut-off valve cooling tower
K037	Flap plate heat exchanger	K082	Distributor ZK
K038	Activation rotation heat exchanger	K083	Controller
K039	Heating pipe	K084	Bypass valve cooling water
K040	Humidifier valve (controlled)	K085	Valve cooling water general
K041	Humidifier solenoid valve (refeeding)	K086	Valve cold water general
K042	Humidifier blowdown pipe	K087	Tapper 2-way
Ko44	Electr. steam humidifier (controlled)	K088	Blowdown pipe
Ko45	Control element	K089	Control valve cold general
Ko46	Contact coupler	K090	Differential pressure control valve
K050	Zone valve static heating	K091	Inlet guide vane supply fan
K051	Control valve cooling ceiling	K092	Inlet guide vane exhaust fan
K052	Control valve static heating	K093	Pneumatic shut-off valve supply air
K053	SHE module for controlling SHE or SES components	K094	Vari-Tapper
K054	FPC module for detecting signal states of the FPC	K095	Coupler
K057	System coupler (e.g. iLON, DP LINK, bus coupler EIB etc.)	K096	Splitter 2-way

ID	Operating equipment	ID	Operating equipment
K058	Pressure control unit	K097	Shut-off valve general
K059	Parameterising unit	K098	Solenoid valve
K060	Repeater	K099	Control valve plate heat exchanger
K061	Router		

2.3.5.7 *M Motors*

(provision of mechanical energy (mechanical rotary or linear movement) for drive purposes)

ID	Operating equipment	ID	Operating equipment
M010	Motor RLT	M013	Motor cold water
M012	Motor heating	M014	Motor sanitary

2.3.5.8 *N Controllers*

(Devices of control, regulation and computing technology, electronic controllers, analogue functions, software control functions)

ID	Operating equipment	ID	Operating equipment
N010	Supply air temperature	N028	Control exhaust air pressure
N011	Exhaust air temperature	N030	Single room controller
N012	Room temperature	N050	Flow temperature heating according to heating characteristic
N013	Supply air/room temp. (cascade)	N051	Limit controller return temperature heating
N014	Supply air/exh. air temp. (cascade)	N052	Flow temperature heating (static)
N015	Limit controller first heat exchanger return temperature	N053	Flow temperature heating dynamic
N016	Limit controller HR	N055	Tank temperature hot water heater
N017	Limit controller frost protection	N056	Tank temperature hot water heater HR
N018	HR/mixed air control	N057	Limiting temperature Hot water heater
N019	Limit controller second heat exchanger Return temperature	N058	Limiting temperature Hot water heater
N020	Supply air humidity	N059	Controller pipe heater
N021	Exhaust air humidity	N060	Pressure control heating
N022	Room humidity	N072	Flow temperature control Heat exchanger
N023	Supply air/room humidity (cascade)	N083	Cooling water controller
N024	Supply/exh. air humidity (cascade)	N086	Cold water controller
N027	Control supply air pressure		

2.3.5.9 P Display/Information

(display of information)

ID	Operating equipment	ID	Operating equipment
P003	Water consumption general	P034	Flow meter water
P004	Water consumption sprinkler	P037	Flow meter GAS
P005	Water consumption refeeding cold/cooling towers	P045	Household water meter (without el.)
P006	Water consumption refeeding media	P049	Flash lamp / optical alarm
P008	Electric meter medium voltage	P050	External indicator
P009	Electric meter low voltage	P051	Alarm bell
P010	Temperature display	P052	Horn/acoustic alarm
P011	Pressure display	P070	Warning transparent CO warning systems
P012	Humidity display	P071	Horn CO warning systems
P013	Flow display	P072	Terminal
P015	Warning transparent "Gas alarm"	P080	Acoustic signal transmitter
P020	Energy meter heating water	P081	Acoustic/optical signal transmitter
P021	Energy meter heating steam Heizung Dampf	P085	Built-in loudspeaker
P022	Flow meter heating water	P086	Mounted loudspeaker
P025	Flow meter condensation	P087	Funnel loudspeaker
P030	Energy meter cold water	P092	Sub-clock
P031	Energy meter cold steam		

2.3.5.10 Q Switching Energy

(controlled switching or variation of an energy, signal or material flow (for signals in regulating/control circuits, see classes K and S))

ID	Operating equipment	ID	Operating equipment
Q003	Smoke extraction flap	Q070	Pressure reducing valve
Q006	Diffusion grille as exhaust air grille	Q071	Block lock
Q007	Twist outlet	Q072	Blocking element
Q008	Air outlet	Qo8o	Non-contact sink fitting
Q009	Ventilation valve	Q081	Shower head
Q010	Slit outlet	Q082	Pressure reducing valve
Q011	Combination of weather-proof grille and blind flap	Q083	Infrared controlled urinal flush
Q012	Outside air flap (open/closed)	Q086	Ballcock
Q013	Supply air flap (open/closed)	Q087	Cutting fitting
Q021	Outgoing air flap (open/closed)	Q088	Outlet valve
Q022	Exhaust air flap (open/closed)	Q089	Ventilation valve
Q031	Circulating air flap (open/closed)	Q090	Shower tray drain valve
Q032	Volume flow controller supply air (OPEN/CLOSED), motorised air outlets	Q091	Three-way tap

ID	Operating equipment	ID	Operating equipment
	supply air		
Q033	Volume flow controller exhaust air (OPEN/CLOSED), motorised air outlets exhaust air	Q092	Throttle and shut-off valve
Q034	Constant volume flow controller, supply air.	Q093	Corner valve
Q035	Constant volume flow controller exhaust air.	Q094	Drain valve
Q036	Gas ballcock	Q095	Flange shut-off valve
Q037	Gas motor valve	Q096	Slide
Q045	Radiator valves, thermostatic radiator valve	Q097	Y-type valve
Q046	Radiator valve with thermal drive	Q098	One hand, one hole battery
Q050	Ventilation ceiling	Q099	Mixer battery

2.3.5.11 *S Switches, Selectors*

(conversion of a manual actuation into a certain signal for further processing)

ID	Operating equipment	ID	Operating equipment
S010 .	Repair switch supply fan	S054	station SHE staircase Control unit
S011	Local control station command OFF	So6o	Operating equipment Control station SHE staircase Control unit
S012	Local control station 1-stage	S061	ON/off devices
S013	Local control station multi-stage	S062	Electrical switch-on device
S015	Blind switch (actuators), position switch sun protection room	S070	Safety door opener
S016	Light circuit	S071	Panic lock press function
S020	Repair switch exhaust fan	S072	Panic lock bolt
S023	Limit switch flap feedback	S081	Repair switch cooling tower fan
S03o	Switches/operating devices	S083	Repair switch cooling water pump
S031	Window contact/room monitoring	S086	Repair switch cold water pump
S037	Repair switch boiler	S088	Call button
S039	SHE trigger button	S089	Repair switch supply/distributor pumps cold water
S040	Repair switch pre-heater pump	S095	Local control station circulating air coolers
S041	Repair switch post-heater pump	S096	Local control station digestorium
S05o	Repair switch humidifier pump	S097	Local smoke extraction switch
S052	Repair switch humidifier pump	S098	Emergency stop switch HVAC centres
S053	Control station smoke extraction		

2.3.5.12 T Energy Transformation

(transformation of energy with retention of the unique property. Transformation of an existing signal with retention of the information content. Changing of the form or constitution of a material)

ID	Operating equipment	ID	Operating equipment
T002	Transformer 10kV	T041	Drip separator
T004	Transformer 400V	T042	Telephone
T010	Pre-heater	T044	ID card reader
T011	Post-heater	T049	Power supply unit
T020	Cooler	T050	Heat exchanger heating
T029	Transformer/power supply ERR	T051	Supply low temperature
T030	HR recuperative	T060	Ela voice station
T031	Rotation heat exchanger	T079	Heat exchanger cold
T032	Plate heat exchanger	T080	Supply cooling ceiling
T033	Circulating air system	T090	Pressure reduction station compressed air
T040	Air humidifier		

2.3.5.13 U Fastening Assembly

(holding of objects in a defined position)

ID	Operating equipment	ID	Operating equipment
U010	Vibration damper	U050	Layout panel
U011	Insulator	U051	Main system panel
U049	Built-in distributor cabinet	U052	Fire service panel

2.3.5.14 V Processing

(processing (treatment) of materials or products (including pre-treatment and post-treatment)

ID	Operating equipment	ID	Operating equipment
V001	Mobile carbon dioxide fire extinguisher	V026	Dosing device
V002	Carbon dioxide hand extinguisher	V027	BIOCIDE system
V003	Foam hand extinguisher	V028	Ozoning
V004	Special hand extinguisher	V030	Chopping
V010	Channel filter, unit filter supply air	V031	Filter
V011	Channel filter, unit filter exh. air	V032	Dirt trap
V012	E-filter	V033	Screen
V013	Channel filter, unit filter supply air	V034	Mixers and agitators
V014	Channel filter, unit filter exh. air	Vo35	Chopping
V015	E-filter	V070	Coarse trap
V020	Filter	V071	Coarse filter bag system

ID	Operating equipment	ID	Operating equipment
V021	Dirt trap	V072	Water protective filter
V024	Refeeding	V073	Odour seal
V025	Softener	V090	Fire extinguisher system Ansul R 102

2.3.5.15 *W Transport*

(conducting or guiding of energy, signals, materials or products from one place to another)

ID	Operating equipment	ID	Operating equipment
W001	Lifting gear	W063	Distributor hot water
W002	Crane systems	W064	Domestic water
W003	Tube post	W065	Distributor domestic water
W010	Duct network supply air	W070	Drain sink
W011	Duct network exhaust air	W071	Bathtub
W012	Duct network system	W072	Urinal
W013	Outlets supply air	W073	Vacuum toilet
W014	Outlets exhaust air	W074	Shower
W040	Steam network	W075	Deep flush closet
W041	Condensation network	W076	Wash basin WC
W042	Flow supply	W077	Sink kitchenette, kitchen
W043	Return supply	W080	Gas filter
W045	Hydraulic diverter	W085	ELA distributor
W046	Overflow	W086	Connection socket
W047	Distributor	W087	Distributor 4-fold
W048	Flow distribution	W088	Distributor single
W049	Return distribution	W090	Fall line venting
W050	SHE branch socket motor	W091	Roof inlets
W060	Cold water	W092	Floor inlets
W061	Distributor cold water	W093	Outside inlets
W062	Hot water	W094	Drainage

2.3.5.16 *X Connection*

(connecting objects)

ID	Operating equipment	ID	Operating equipment
X001	Compensator, corrugated pipe compensator	X040	Drain connection for sprinkler pipe network
X020	Socket 400V	X041	Connection SAT
X021	Socket 230V	X042	Connection FOC
X022	Socket combination	X050	Water connection – filling tank Sprinkler pump, -extinguishing water supply tank
X028	Connection socket IT	X061	Terminator

ID	Operating equipment	ID	Operating equipment
X029	Floor tanks, technical columns	X093	Potential equibonding rail
X030	Drain and purge connection for test devices, sprinkler purge line		

2.3.6 8th Level (Physical Measuring Variable), 25th Place

Designation based on ISO/DIS 14617-6

26th place	Measuring variable/ input variable
D	Density
E	Electrical variable
F	Flow, throughput
G	Distance, length, position
H	Manual input, manual intervention
K	Time
L	State (also of separating layer)
M	Humidity
N	Freely available
O	Freely available
P	Pressure
Q	Quality variable (analysis, material properties) (except D, M, V)
R	Radiation variables
S	Speed, rotation speed, frequency
T	Temperature
U	Combined variable
V	Viscosity
W	Weight force, mass
X	Other variables
Y	Freely available

2.3.7 9th Level, (Data Point Function), 27th place (ISO-DIS 14617-6)

Letters for measured or initiating variables

27th place	Data point
A	Alarm message
B	Operating message
E	General message
F	SetPoint / nominal value
G	Limit value message
N	Normal operation message
O	Local/remote message
P	Controller
R	Feedback

27th place	Data point
S	Switching command
V	Virtual parameter
W	Maintenance message
X	Measured value
Y	Positioning / adjusting command
Z	Counter

2.3.8 10th Level (Serial Data Point), 27th to 28th Place

Serial number of the data point

3   Transfer File

The entire PLC programming must be transferred to the customer in the form of a digital transfer file in the .csv (comma separated file) format. Spaces are not permissible, every data point has its own line.

This transfer file must contain at least the following information:

- Variable name = SIK (system identification key)
- Clear text with reference to function and sub-assembly designation in the system schematic
- Type of variable (Binary Input / Output, Analogue Input / Output, Text Format)
- Physical unit (for analogue variable)
- Valid value range (e.g. measuring range of the sensor)
- Scaling range, if a conversion is necessary
- Specification of the function (fault message/operating message/feedback/nominal value/positioning command/switching command/maintenance message
- Status texts assigned to the value (open/closed/on/off/stage xx)
- Complete access name in full OPC or DA server syntax
- In drives the electrical power per stage for the energy consumption recording

All data points must have a reference to the automation schematic to be delivered in accordance with ISO 16484-3. The systems/sub-assemblies must be identified by the same identification system in these of course.