mecc alte

POWER FROM WITHIN

PLC ENVIRONMENT CONTROLLER

SMARTECH

TECHNICAL MANUAL

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01	07/10/2013	Change of logo and document structure
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1. Introduction

This document describes the PLC environment and the related configurable logic introduced on the DST4602, GC600, MC200 and HS315 controllers.

The application “Mecc Alte PlcEditor” simplifies its creation due a visual programming in graphical format. It provides PLC functions models that will have to be completed by the user.

Once the PLC program is finalized, you need to compile it and send it to the controller through the “Mecc Alte PlcEditor” application.

"Mecc Alte PlcEditor", from version 2.08, also allows to operate online, displaying in real time the value of the resources used in the PLC logics.

2. PLC Logic

The PLC logic is described in functional PLC blocks, each of them described in an XML file as a “node” with the following syntax:

<OPCODE number=”1” xpos=”0” ypos=”0” description=””></OPCODE>

- OPCODE: it identifies the type of block (for example “AND”),
- “number”: block progressive number. All the blocks must be numbered with a progressive number, starting from “1”.
- “xpos”: X coordinate of the block in the working sheet, referred to the upper left angle of the block.
- “ypos”: Y coordinate of the block in the working sheet, referred to the upper left angle of the block.
- “description”: possible note related to the block,

The XML node representing a block can contain other fields to indicate the input and/or output resources of the block. These resources can be system resources (digital or analogue inputs / outputs, alarms, measurements, etc.) or numerical constant values.

During the creation of the PLC logic, it is possible to introduce notes or to exclude some parts of the program. As per the XML language, the syntax expects to enter “<!--” at the beginning and “-->” at the end of the area to note, for example

<!-- enter the note here -->

It’s important to know that a PLC logic can always be read back from a controller (having the access password) and it will be fully recreated.

The PLC logic is executed by the controller every 100 msec: you need to consider that during the implementation of the timed features.

3. PLC Resources

Each PLC resource is referred by a unique identifier, made up by two initial characters that define its type, always followed by the character "_"; the other following characters define its subtype and index.

List of the first two characters that identify the type of resource:

- "DI": digital inputs (binary format).
- "DI(V)": virtual digital inputs (binary format).
- "DI(S)": shared digital inputs (binary format).
- "DO": digital outputs (binary format).
- "DT": digital temporary supports (binary format).
- "AL": alarms (binary format).
- "ST": controller's internal statuses (binary format).
- "AI": analogue inputs (numerical format).
- "AI(V)": virtual analogue inputs (numerical format).
- "AI(S)": shared analogue inputs (numerical format).
- "AO": analogue outputs (numerical format).
- "AM": measurements acquired by the controller (numerical format- e.g. engine speed).
- "AT": numerical temporary supports (numerical format).
- "SP": set points (numerical format).
- "KK": constants (numerical format).

For example:

- DI_VIRTUAL_15 identifies the virtual digital input 15 of the controller.
- DT_025 identifies the digital temporary resource 25.
- SP_010 identifies the set point 10.

3.1 Digital resources

Only for the digital resources, it is possible to invert the status of the resource by adding the sign "-" before the identifier:

- For "input" resources, the sign "-" inverts the status before using it.
- With output resources the sign "-" inverts the status before recording it.

The inversion of the logic status of the digital resources (inputs / outputs) can be configured also in the controller's parameters (by means BoardPrg3). It's important to remember that the PLC uses the "logical" status of the resources, so it might be different from the "physical" because of the said inversion.

3.1.1 DI - Digital Inputs

The digital inputs can be normally used as input resources only; the "virtual digital inputs" (part of the digital inputs) are exceptions, because they can be used also as output resources of the PLC blocks.

There are three types of digital inputs:

- **Digital inputs of the controller**. They represent the internal “logical” status of the controller’s “physical” digital inputs. They are identified by the sign “DI_CONTROLLER_XX”, where “XX” indicates the number (starting from 1) of the digital input.
- **Virtual digital inputs**. They do not correspond to “physical” inputs of the controller, but they are internal digital values (thus they can be used also as output resources of the PLC blocks): the controller manages them exactly as “physical” ones. They are identified by the sign “DI_VIRTUAL_XX”, where “XX” indicates the number (starting from 1).
- **Shared digital inputs**. They do not correspond to “physical” inputs of the controller, but they are internal digital values. They are generated only as output resources of the PLC blocks or received via CAN-Bus from the others controllers; the controller manages them exactly as “physical” ones. They are identified by the sign “DI_SHARED_XXX”, where “XXX” indicates the number (starting from 1).
- **Digital inputs of the expansion modules (DITEL)**. They represent the internal “logic” status of the expansion modules’ digital inputs. Each DITEL module contains 16 digital inputs. They are identified by the sign “DI_DITEL_YY_XX”, where “YY” indicates the number of the DITEL module, while “XX” indicates the number of the module’s digital input. Modules and inputs numbering starts from 1 (“DI_DITEL_03_12” identifies the input 12 of the third DITEL module).

3.1.2 DO - Digital Outputs

The digital outputs can be used as input or output resources of the PLC blocks. If they are used as outputs, you need to configure them as “Used by PLC” (function DIF.0101) in the parameters of the controller (parameter P.3001 and following).

There are two types of digital outputs:

- **Digital outputs of the controller**. They represent the internal “logical” status of the controller’s “physical” digital outputs. They are identified by the sign “DO_CONTROLLER_XX”, where “XX” indicates the number (starting from 1) of the digital output.
- **Digital outputs of the expansion modules (DITEL)**. They represent the internal “logical” status of the expansion modules’ digital outputs. Each DITEL module contains 16 digital outputs. They are identified by the sign “DO_DITEL_YY_XX”, where “YY” indicates the number of the DITEL module, while “XX” indicates the number of the module’s digital output. Modules and inputs numbering starts from 1 (“DI_DITEL_05_10” identifies the output 10 of the fifth DITEL module).

3.1.3 DT - Digital temporary supports

The DT resources are digital temporary memory included in the volatile memory of the controller; thus, they are set to zero at every system start. They can be used both as input and output resources of the PLC blocks. It’s possible to create a “chain” of blocks where the same DT resource is the output of a block and becomes the input of the following PLC block.

If a DT resource is used as an output more than once, the compiler displays a warning (during compilation): it is in fact possible to reuse a DT resource several times as an output, but it is necessary to pay attention to the order of execution of the blocks, to ensure that each output value is correctly used by the next "cascade" block.

They are identified by the sign “DT_XXX”, where “XXX” indicates the number (starting from 1) of the digital temporary resource.

3.1.4 AL - Alarms

The AL resources represent the anomalies of the controller, and are normally used only as input resources for the PLC blocks. The “alarms reserved to the PLC” (part of the alarms) are exceptions, because they can be used also as output resources, but only for the ALARM block. There are four categories of digital alarms:

- **Controller’s generic alarms**. Refer to the technical manual of the controller to identify the alarm code (ex. AL_048 refers to the “Emergency stop” alarm).
- **PLC Alarms**. The text of each PLC alarm can be defined by the user when writing the program and it will be displayed on the controller when the related event will happen (available codes from 961 to 964).
- **Alarms connected to the status of the analogue inputs**.
- **Alarms connected to the status of the digital inputs**.

3.1.5 ST - Statuses of the controller

The ST resources represent the internal statuses of the controller (e.g. “Engine started” status) in digital format and can be used only as input resources of the PLC blocks. They can never be used as output resources.

The identifier is ST_XXX, where “XXX” is the index of the status required:

3.1.5.1 DST4602 (rev. 01.36)

Status	Rev.	Description
ST_000	0.00	OFF_RESET
ST_001	0.00	MAN
ST_002	0.00	AUTO
ST_003	0.00	TEST
ST_004	0.00	AVVIAMENTO REMOTO
ST_006	0.64	Acknowledgment of anomalies in progress
ST_007	0.64	Reset of anomalies in progress
ST_008	0.00	Warnings
ST_009	0.00	Unloads
ST_010	0.00	Deactivations
ST_011	0.00	Alarms
ST_012	0.00	Not recognized warnings
ST_013	0.00	Not recognized unloads
ST_014	0.00	Not recognized deactivations
ST_015	0.00	Not recognized alarms
ST_016	0.00	Mains present (voltages/frequency)
ST_017	0.00	Mains absent or out of thresholds
ST_018	0.00	Delay for mains in thresholds
ST_019	0.00	Mains in thresholds
ST_020	0.00	Delay for mains absent or out of thresholds
ST_024	0.00	Generator present (voltages/frequency)
ST_025	0.00	Generator absent or out of thresholds
ST_026	0.00	Delay for generator in thresholds
ST_027	0.00	Generator in thresholds
ST_028	0.00	Delay for generator absent or out of thresholds
ST_032	0.00	Engine running
ST_033	0.00	Lube oil protections enabled
ST_035	0.00	Engine management: stopped
ST_036	0.00	Engine management: starting
ST_037	0.00	Engine management: idle speed
ST_038	0.00	Engine management: delay before supply
ST_039	0.00	Engine management: ready to supply
ST_040	0.00	Engine management: cooling down

ST_041	0.00	Engine management: stopping
ST_048	0.00	Bus-bars live (voltages)
ST_051	0.32	Protection 27Q activated
ST_052	0.00	Mains fault protections activated (mains absent)
ST_053	0.00	Protection 27 activated (U<<, 1° threshold)
ST_054	0.00	Protection 59 activated (U>>, 1° threshold)
ST_055	0.00	Protection 81< activated (f<<, 1° threshold)
ST_056	0.00	Protection 81> activated (f>>, 1° threshold)
ST_057	0.00	Protection ROCOF activated
ST_058	0.00	Protection VECTOR JUMP activated
ST_059	0.07	Protection 27 activated (U<, 2° threshold)
ST_060	0.07	Protection 59 activated (U>, 2° threshold)
ST_061	0.07	Protection 81< activated (f<, 2° threshold)
ST_062	0.07	Protection 81> activated (f>, 2° threshold)
ST_064	0.00	GCB status
ST_065	0.00	MCB status
ST_066	0.00	MGCB status
ST_068	0.00	GCB closure command (stable)
ST_069	0.00	MCB closure command (stable)
ST_070	0.17	GCB minimum voltage coil
ST_071	0.17	GCB opening pulse
ST_072	0.17	GCB closure pulse
ST_073	0.17	MCB minimum voltage coil
ST_074	0.17	MCB opening pulse
ST_075	0.17	MCB closure pulse
ST_080	0.00	Start inhibited by contact
ST_081	0.00	Start inhibited by clock/calendar
ST_082	0.00	Start inhibited by load function
ST_083	0.00	Start inhibited because it's not possible to supply without mains and mains is absent
ST_084	0.00	Start inhibited because another genset has the GCB not opened
ST_086	0.00	Start inhibited by MC controller
ST_088	0.00	GCB closure inhibited by contact
ST_089	0.00	GCB closure inhibited because it's not possible to supply without mains and mains is absent
ST_090	0.00	GCB closure inhibited by serial port
ST_091	0.00	GCB closure inhibited because another genset has the GCB not opened
ST_092	0.00	GCB closure inhibited by reverse synchronization
ST_093	0.00	GCB closure inhibited by MC controller
ST_096	0.00	Ready to supply
ST_097	0.00	Direct synchronization in progress
ST_098	0.00	Reverse synchronization in progress
ST_099	0.33	Synchronized
ST_100	0.00	Ramp up in progress
ST_101	0.00	Ramp down in progress
ST_102	0.00	Supplying in parallel with mains
ST_103	0.00	Supplying in parallel with other gensets
ST_104	0.00	Supplying not in parallel
ST_108	0.17	Emergency plant
ST_109	0.17	Parallel to grid plant
ST_110	0.17	Parallel to other genset plant
ST_111	0.00	No MC controllers on the bus PMCB
ST_112	0.04	Sync per second
ST_113	0.04	Sync per minute
ST_114	0.04	Sync per hour
ST_127	0.89	Daylight Save Time
ST_128	0.17	Glow-plugs preheat command
ST_129	0.17	ECU enable command
ST_130	0.17	Fuel solenoid
ST_131	0.17	Gas valve

ST_132	0.17	Crank motor
ST_133	0.17	Stop solenoid
ST_134	0.17	Idle speed command
ST_135	0.17	Coolant pre-heat command
ST_136	0.17	Pre-lubrication command
ST_137	1.02	Inhibit DPF regeneration
ST_138	1.02	Force DPF regeneration
ST_139	1.28	AdBlue pump command
ST_140	1.28	AdBlue solenoid command
ST_144	0.48	GCB closed on genset 01
ST_145	0.48	GCB closed on genset 02
ST_146	0.48	GCB closed on genset 03
ST_147	0.48	GCB closed on genset 04
ST_148	0.48	GCB closed on genset 05
ST_149	0.48	GCB closed on genset 06
ST_150	0.48	GCB closed on genset 07
ST_151	0.48	GCB closed on genset 08
ST_152	0.48	GCB closed on genset 09
ST_153	0.48	GCB closed on genset 10
ST_154	0.48	GCB closed on genset 11
ST_155	0.48	GCB closed on genset 12
ST_156	0.48	GCB closed on genset 13
ST_157	0.48	GCB closed on genset 14
ST_158	0.48	GCB closed on genset 15
ST_159	0.48	GCB closed on genset 16
ST_160	0.48	GCB closed on genset 17
ST_161	0.48	GCB closed on genset 18
ST_162	0.48	GCB closed on genset 19
ST_163	0.48	GCB closed on genset 20
ST_164	0.48	GCB closed on genset 21
ST_165	0.48	GCB closed on genset 22
ST_166	0.48	GCB closed on genset 23
ST_167	0.48	GCB closed on genset 24
ST_176	0.48	Master genset
ST_192	0.62	Unloading on genset 01
ST_193	0.62	Unloading on genset 02
ST_194	0.62	Unloading on genset 03
ST_195	0.62	Unloading on genset 04
ST_196	0.62	Unloading on genset 05
ST_197	0.62	Unloading on genset 06
ST_198	0.62	Unloading on genset 07
ST_199	0.62	Unloading on genset 08
ST_200	0.62	Unloading on genset 09
ST_201	0.62	Unloading on genset 10
ST_202	0.62	Unloading on genset 11
ST_203	0.62	Unloading on genset 12
ST_204	0.62	Unloading on genset 13
ST_205	0.62	Unloading on genset 14
ST_206	0.62	Unloading on genset 15
ST_207	0.62	Unloading on genset 16
ST_208	0.62	Unloading on genset 17
ST_209	0.62	Unloading on genset 18
ST_210	0.62	Unloading on genset 19
ST_211	0.62	Unloading on genset 20
ST_212	0.62	Unloading on genset 21
ST_213	0.62	Unloading on genset 22
ST_214	0.62	Unloading on genset 23
ST_215	0.62	Unloading on genset 24
ST_224	0.89	Calendar 1

ST_225	0.89	Calendar 2
ST_226	0.89	Calendar 3
ST_227	0.89	Calendar 4
ST_228	0.89	Calendar 5
ST_229	0.89	Calendar 6
ST_230	0.89	Calendar 7
ST_231	0.89	Calendar 8
ST_232	0.89	Calendar 9
ST_233	0.89	Calendar 10
ST_234	0.89	Calendar 11
ST_235	0.89	Calendar 12
ST_236	0.89	Calendar 13
ST_237	0.89	Calendar 14
ST_238	0.89	Calendar 15
ST_239	0.89	Calendar 16
ST_240	1.25	Timer 1
ST_241	1.25	Timer 2
ST_242	1.25	Timer 3
ST_243	1.25	Timer 4
ST_256	0.87	CAN 0 BUS-OFF
ST_257	0.87	CAN 0 ERR-PASSIVE
ST_258	0.87	CAN 0 ERR-ACTIVE
ST_259	0.87	No communication on CAN 0
ST_260	0.87	CAN 1 BUS-OFF
ST_261	0.87	CAN 1 ERR-PASSIVE
ST_262	0.87	CAN 1 ERR-ACTIVE
ST_263	0.87	No communication on CAN 1
ST_264	0.87	CAN 2 BUS-OFF
ST_265	0.87	CAN 2 ERR-PASSIVE
ST_266	0.87	CAN 2 ERR-ACTIVE
ST_267	0.87	No communication on CAN 2
ST_304	1.05	START button
ST_305	1.05	STOP button
ST_306	1.05	GCB button
ST_307	1.05	MCB button
ST_308	1.05	MODE UP button
ST_309	1.05	MODE DOWN button
ST_310	1.05	UP button
ST_311	1.05	DOWN button
ST_312	1.05	LEFT button
ST_313	1.05	RIGHT button
ST_314	1.05	ENTER button
ST_315	1.05	EXIT button
ST_316	1.05	SHIFT button
ST_317	1.05	ACK button
ST_320	1.10	Status #01 from engine management by file
ST_321	1.10	Status #02 from engine management by file
ST_322	1.10	Status #03 from engine management by file
ST_323	1.10	Status #04 from engine management by file
ST_324	1.10	Status #05 from engine management by file
ST_325	1.10	Status #06 from engine management by file
ST_326	1.10	Status #07 from engine management by file
ST_327	1.10	Status #08 from engine management by file
ST_328	1.10	Status #09 from engine management by file
ST_329	1.10	Status #10 from engine management by file
ST_330	1.10	Status #11 from engine management by file
ST_331	1.10	Status #12 from engine management by file
ST_332	1.10	Status #13 from engine management by file
ST_333	1.10	Status #14 from engine management by file

ST_334	1.10	Status #15 from engine management by file
ST_335	1.10	Status #16 from engine management by file
ST_336	1.10	Application type: SPM
ST_337	1.10	Application type: SSB
ST_338	1.10	Application type: SSB+SSTP
ST_339	1.10	Application type: SPTM
ST_340	1.10	Application type: SPTM+SSB
ST_341	1.10	Application type: MPM
ST_342	1.10	Application type: MSB
ST_343	1.10	Application type: MSB+MSTP
ST_344	1.10	Application type: MPTM
ST_345	1.10	Application type: MPTM+MSB
ST_352	01.27	Maximum deliverable power limited for low mains frequency
ST_353	01.27	Delivered active power limited for high mains frequency
ST_354	01.27	Delivered active power limited for high mains voltage
ST_355	01.27	Delivered active power limited by external command
ST_367	01.27	Enable protections 27 for low mains voltage
ST_368	1.36	Active regeneration status: not active (spn3700=0)
ST_369	1.36	Active regeneration status: active (spn3700=1)
ST_370	1.36	Active regeneration status: will start soon (spn3700=2)
ST_371	1.36	DPF status: regeneration not required (spn3701=0)
ST_372	1.36	DPF status: regeneration needed - lowest level (spn3701=1)
ST_373	1.36	DPF status: regeneration needed - moderate level (spn3701=2)
ST_374	1.36	DPF status: regeneration needed - highest level (spn3701=3)
ST_997	0.39	PLC first scan
ST_998	0.00	Always ON
ST_999	0.00	Always OFF

3.1.5.2 GC600 (rev. 01.52)

Status	Rev.	Description
ST_000	1.00	OFF_RESET
ST_001	1.00	MAN
ST_002	1.00	AUTO
ST_003	1.00	TEST
ST_004	1.00	REMOTE START
ST_006	1.00	Identification ongoing anomalies
ST_007	1.00	Reset ongoing anomalies
ST_008	1.00	Warning total
ST_009	1.00	Unload cumulative
ST_010	1.00	Deactivations cumulative.
ST_011	1.00	Blocks total
ST_012	1.00	Unacknowledged warnings total
ST_013	1.00	Not recognised unloads cumulative
ST_014	1.00	Unacknowledged deactivations cumulative
ST_015	1.00	Unacknowledged blocks total
ST_016	1.00	Presence of mains voltage/frequency
ST_017	1.00	Mains out of tolerance or off
ST_018	1.00	Delay for mains in tolerance
ST_019	1.00	Mains in tolerance
ST_020	1.00	Delay for mains out of tolerance or off
ST_024	1.00	Generator voltage/frequency present
ST_025	1.00	Generator out of tolerance or absent
ST_026	1.00	Delay for generator within tolerance.
ST_027	1.00	Generator in tolerance
ST_028	1.00	Delay for generator out of tolerance or absent
ST_032	1.00	Engine started
ST_033	1.00	Oil protections enabled
ST_035	1.00	Engine sequence: standby

ST_036	1.00	Engine sequence: starting
ST_037	1.00	Engine sequence: low speed
ST_038	1.00	Engine sequence: delay before power delivery
ST_039	1.00	Engine sequence: ready to deliver
ST_040	1.00	Engine sequence: cooling
ST_041	1.00	Engine sequence: arrest
ST_048	1.00	Presence of bar voltages
ST_051	1.00	Protection 27Q active
ST_052	1.00	Mains parallel protections active (mains off)
ST_053	1.00	Protection 27 active (U<<, 1st threshold)
ST_054	1.00	Protection 59 active (U>>, 1st threshold)
ST_055	1.00	Protection 81 active (f<<, 1st threshold)
ST_056	1.00	Protection 81 active (f>>, 1st threshold)
ST_057	1.00	Protection ROCOF active
ST_058	1.00	Protection VECTOR JUMP active
ST_059	1.00	Protection 27 active (U<, 2nd threshold)
ST_060	1.00	Protection 59 active (U>, 2nd threshold)
ST_061	1.00	Protection 81<active (f<, 2nd threshold)
ST_062	1.00	Protection 81>active (f>, 2nd threshold)
ST_063	1.00	Protection 27T active
ST_064	1.00	GCB status
ST_065	1.00	MCB status
ST_066	1.00	MGCB status
ST_068	1.00	GCB steady closing command
ST_069	1.00	MCB steady closing command
ST_070	1.00	GCB under voltage coil
ST_071	1.00	GCB pulse open command
ST_072	1.00	GCB pulse steady closing command
ST_073	1.00	MCB Minimum voltage coil command
ST_074	1.00	MCB pulse open command
ST_075	1.00	MCB pulse steady closing command
ST_080	1.00	Contact start inhibition
ST_081	1.00	Clock/Calendar start inhibition
ST_082	1.00	Starting inhibition from load function
ST_083	1.00	Start inhibition because it is not possible to supply in island mode or in case of mains failure
ST_084	1.00	Starting inhibition because another generator has GCB not open
ST_085	1.00	Start inhibition for excessive limitation of the active power set point
ST_086	1.00	Start inhibited by MC controller
ST_088	1.00	Inhibition of the GCB closing from contact
ST_089	1.00	Inhibition of the GCB closing from serial port
ST_090	1.00	GCB closing inhibition from seal port
ST_091	1.00	GCB closing inhibition because another generator has GCB not open
ST_092	1.00	GCB closing inhibition because a returning synchronization is ongoing
ST_093	1.00	GCB closing inhibition from MC100 board
ST_096	1.00	Ready to supply
ST_097	1.00	Input synchronization
ST_098	1.00	Returning synchronization
ST_099	1.00	Synchronized
ST_100	1.00	Loading phase.
ST_101	1.00	Unloading ramp
ST_102	1.00	Supply in parallel with the mains
ST_103	1.00	Supply in parallel among gensets
ST_104	1.00	Supply
ST_108	1.00	Emergency plant
ST_109	1.00	Plant of parallel with the mains
ST_110	1.00	Parallel plant with other generators
ST_111	1.00	No MC100 on PMCB bus
ST_112	1.00	Synchronization every second

ST_113	1.00	Synchronization every minute
ST_114	1.00	Synchronization every hour
ST_127	1.00	Daylight Save Time
ST_128	1.00	Glow plug pre-heating command
ST_129	1.00	Engine activation command
ST_130	1.00	Fuel solenoid valve command
ST_131	1.00	Gas valve command
ST_132	1.00	Starter motor command
ST_133	1.00	Stop in excitation command
ST_134	1.00	Low speed command (IDLE)
ST_135	1.00	Pre-heating cooling liquid
ST_136	1.00	Pre- lubricating command
ST_137	1.12	Inhibit DPF regeneration
ST_138	1.12	Force DPF regeneration
ST_139	1.38	AdBlue pump command
ST_140	1.38	AdBlue solenoid command
ST_144	1.00	GCB closed on genset 01
ST_145	1.00	GCB closed on genset 02
ST_146	1.00	GCB closed on genset 03
ST_147	1.00	GCB closed on genset 04
ST_148	1.00	GCB closed on genset 05
ST_149	1.00	GCB closed on genset 06
ST_150	1.00	GCB closed on genset 07
ST_151	1.00	GCB closed on genset 08
ST_152	1.00	GCB closed on genset 09
ST_153	1.00	GCB closed on genset 10
ST_154	1.00	GCB closed on genset 11
ST_155	1.00	GCB closed on genset 12
ST_156	1.00	GCB closed on genset 13
ST_157	1.00	GCB closed on genset 14
ST_158	1.00	GCB closed on genset 15
ST_159	1.00	GCB closed on genset 16
ST_176	1.00	Master genset
ST_192	1.00	Unload ramp on generator 01
ST_193	1.00	Unload ramp on generator 02
ST_194	1.00	Unload ramp on generator 03
ST_195	1.00	Unload ramp on generator 04
ST_196	1.00	Unload ramp on generator 05
ST_197	1.00	Unload ramp on generator 06
ST_198	1.00	Unload ramp on generator 07
ST_199	1.00	Unload ramp on generator 08
ST_200	1.00	Unload ramp on generator 09
ST_201	1.00	Unload ramp on generator 10
ST_202	1.00	Unload ramp on generator 11
ST_203	1.00	Unload ramp on generator 12
ST_204	1.00	Unload ramp on generator 13
ST_205	1.00	Unload ramp on generator 14
ST_206	1.00	Unload ramp on generator 15
ST_207	1.00	Unload ramp on generator 16
ST_224	1.00	Calendar 1
ST_225	1.00	Calendar 2
ST_226	1.00	Calendar 3
ST_227	1.00	Calendar 4
ST_228	1.00	Calendar 5
ST_229	1.00	Calendar 6
ST_230	1.00	Calendar 7
ST_231	1.00	Calendar 8
ST_232	1.00	Calendar 9
ST_233	1.00	Calendar 10

ST_234	1.00	Calendar 11
ST_235	1.00	Calendar 12
ST_236	1.00	Calendar 13
ST_237	1.00	Calendar 14
ST_238	1.00	Calendar 15
ST_239	1.00	Calendar 16
ST_240	1.32	Timer 1
ST_241	1.32	Timer 2
ST_242	1.32	Timer 3
ST_243	1.32	Timer 4
ST_256	1.00	CAN 0 BUS-OFF
ST_257	1.00	CAN 0 ERR-PASSIVE
ST_258	1.00	CAN 0 ERR-ACTIVE
ST_259	1.00	No communication on CAN 0
ST_260	1.00	CAN 1 BUS-OFF
ST_261	1.00	CAN 1 ERR-PASSIVE
ST_262	1.00	CAN 1 ERR-ACTIVE
ST_263	1.00	No communication on CAN 1
ST_264	1.00	CAN 2 BUS-OFF
ST_265	1.00	CAN 2 ERR-PASSIVE
ST_266	1.00	CAN 2 ERR-ACTIVE
ST_267	1.00	No communication on CAN 2
ST_304	1.18	START button
ST_305	1.18	STOP button
ST_306	1.18	GCB button
ST_307	1.18	MCB button
ST_308	1.18	MODE UP button
ST_309	1.18	MODE DOWN button
ST_310	1.18	UP button
ST_311	1.18	DOWN button
ST_312	1.18	LEFT button
ST_313	1.18	RIGHT button
ST_314	1.18	ENTER button
ST_315	1.18	EXIT button
ST_316	1.18	SHIFT button
ST_317	1.18	ACK button
ST_320	1.21	Status #01 from engine management by file
ST_321	1.21	Status #02 from engine management by file
ST_322	1.21	Status #03 from engine management by file
ST_323	1.21	Status #04 from engine management by file
ST_324	1.21	Status #05 from engine management by file
ST_325	1.21	Status #06 from engine management by file
ST_326	1.21	Status #07 from engine management by file
ST_327	1.21	Status #08 from engine management by file
ST_328	1.21	Status #09 from engine management by file
ST_329	1.21	Status #10 from engine management by file
ST_330	1.21	Status #11 from engine management by file
ST_331	1.21	Status #12 from engine management by file
ST_332	1.21	Status #13 from engine management by file
ST_333	1.21	Status #14 from engine management by file
ST_334	1.21	Status #15 from engine management by file
ST_335	1.21	Status #16 from engine management by file
ST_336	1.24	Application type: SPM
ST_337	1.24	Application type: SSB
ST_338	1.24	Application type: SSB+SSTP
ST_339	1.24	Application type: SPTM
ST_340	1.24	Application type: SPTM+SSB
ST_341	1.24	Application type: MPM
ST_342	1.24	Application type: MSB

ST_343	1.24	Application type: MSB+MSTP
ST_344	1.24	Application type: MPTM
ST_345	1.24	Application type: MPTM+MSB
ST_352	1.33	Maximum deliverable power limited for low mains frequency
ST_353	1.33	Delivered active power limited for high mains frequency
ST_354	1.33	Delivered active power limited for high mains voltage
ST_355	1.33	Delivered active power limited by external command
ST_367	1.33	Enable protections 27 for low mains voltage
ST_368	1.39	Active regeneration status: not active (spn3700=0)
ST_369	1.39	Active regeneration status: active (spn3700=1)
ST_370	1.39	Active regeneration status: will start soon (spn3700=2)
ST_371	1.39	DPF status: regeneration not required (spn3701=0)
ST_372	1.39	DPF status: regeneration needed - lowest level (spn3701=1)
ST_373	1.39	DPF status: regeneration needed - moderate level (spn3701=2)
ST_374	1.39	DPF status: regeneration needed - highest level (spn3701=3)
ST_384	1.52	Generator 01 active on PMCB
ST_385	1.52	Generator 02 active on PMCB
ST_386	1.52	Generator 03 active on PMCB
ST_387	1.52	Generator 04 active on PMCB
ST_388	1.52	Generator 05 active on PMCB
ST_389	1.52	Generator 06 active on PMCB
ST_390	1.52	Generator 07 active on PMCB
ST_391	1.52	Generator 08 active on PMCB
ST_392	1.52	Generator 09 active on PMCB
ST_393	1.52	Generator 10 active on PMCB
ST_394	1.52	Generator 11 active on PMCB
ST_395	1.52	Generator 12 active on PMCB
ST_396	1.52	Generator 13 active on PMCB
ST_397	1.52	Generator 14 active on PMCB
ST_398	1.52	Generator 15 active on PMCB
ST_399	1.52	Generator 16 active on PMCB
ST_416	1.52	MC 01 active on PMCB
ST_417	1.52	MC 02 active on PMCB
ST_418	1.52	MC 03 active on PMCB
ST_419	1.52	MC 04 active on PMCB
ST_420	1.52	MC 05 active on PMCB
ST_421	1.52	MC 06 active on PMCB
ST_422	1.52	MC 07 active on PMCB
ST_423	1.52	MC 08 active on PMCB
ST_424	1.52	MC 09 active on PMCB
ST_425	1.52	MC 10 active on PMCB
ST_426	1.52	MC 11 active on PMCB
ST_427	1.52	MC 12 active on PMCB
ST_428	1.52	MC 13 active on PMCB
ST_429	1.52	MC 14 active on PMCB
ST_430	1.52	MC 15 active on PMCB
ST_431	1.52	MC 16 active on PMCB
ST_432	1.52	BTB 01 active on PMCB
ST_433	1.52	BTB 02 active on PMCB
ST_434	1.52	BTB 03 active on PMCB
ST_435	1.52	BTB 04 active on PMCB
ST_436	1.52	BTB 05 active on PMCB
ST_437	1.52	BTB 06 active on PMCB
ST_438	1.52	BTB 07 active on PMCB
ST_439	1.52	BTB 08 active on PMCB
ST_448	1.52	RN 01 active on PMCB
ST_449	1.52	RN 02 active on PMCB
ST_450	1.52	RN 03 active on PMCB
ST_451	1.52	RN 04 active on PMCB

ST_452	1.52	RN 05 active on PMCB
ST_453	1.52	RN 06 active on PMCB
ST_454	1.52	RN 07 active on PMCB
ST_455	1.52	RN 08 active on PMCB
ST_464	1.52	Validity of shared digital input 1
…	1.52	…
ST_719	1.52	Validity of shared digital input 256
ST_720	1.52	Validity of shared analogue input
…	1.52	…
ST_751	1.52	Validity of shared analogue input32
ST_997	1.00	First PLC scan
ST_998	1.00	Always active
ST_999	1.00	Always not active

3.1.5.3 MC200 (rev. 01.26)

Status	Description
ST_000	OFF_RESET.
ST_001	MAN.
ST_002	AUTO.
ST_003	TEST.
ST_004	AVVIAMENTO REMOTO.
ST_006	Acknowledgment of anomalies in progress.
ST_007	Reset of anomalies in progress.
ST_008	Warnings.
ST_009	Unloads.
ST_011	Alarms.
ST_012	Not recognized warnings.
ST_013	Not recognized unloads.
ST_015	Not recognized alarms.
ST_016	Mains present (voltages/frequency).
ST_017	Mains absent or out of thresholds.
ST_018	Delay for mains in thresholds.
ST_019	Mains in thresholds.
ST_020	Delay for mains absent or out of thresholds.
ST_048	Load bus-bars live (voltages).
ST_049	Generators bus-bars live (voltages).
ST_051	Protection 27Q activated.
ST_052	Mains fault protections activated (mains absent).
ST_053	Protection 27 activated (U<<, 1° threshold).
ST_054	Protection 59 activated (U>>, 1° threshold).
ST_055	Protection 81< activated (f<<, 1° threshold).
ST_056	Protection 81> activated (f>>, 1° threshold).
ST_057	Protection ROCOF activated.
ST_058	Protection VECTOR JUMP activated.
ST_059	Protection 27 activated (U<, 2° threshold).
ST_060	Protection 59 activated (U>, 2° threshold).
ST_061	Protection 81< activated (f<, 2° threshold).
ST_062	Protection 81> activated (f>, 2° threshold).
ST_063	Protection 27T activated.
ST_064	GCB status.
ST_065	MCB status.
ST_066	MGCB status.
ST_068	MGCB closure command (stable).
ST_069	MCB closure command (stable).
ST_070	MGCB minimum voltage coil.
ST_071	MGCB opening pulse.
ST_072	MGCB closure pulse.
ST_073	MCB minimum voltage coil.

Status	Description
ST_074	MCB opening pulse.
ST_075	MCB closure pulse.
ST_080	Start inhibited by contact.
ST_081	Start inhibited by clock/calendar.
ST_083	Start inhibited because it's not possible to supply without mains and mains is absent.
ST_084	Start inhibited because another genset has the GCB not opened.
ST_088	GCB closure inhibited by contact.
ST_089	GCB closure inhibited because it's not possible to supply without mains and mains is absent.
ST_090	GCB closure inhibited by serial port.
ST_091	GCB closure inhibited because another genset has the GCB not opened.
ST_092	MGCB closure inhibited because MCB parallel failure.
ST_093	MGCB closure inhibited because no gensets available.
ST_094	MGCB closure inhibited by TEST without load.
ST_095	GCB closure inhibited by reverse synchronization.
ST_096	Ready to supply.
ST_097	MCB synchronization in progress.
ST_098	MGCB synchronization in progress.
ST_099	Synchronized.
ST_100	Ramp up in progress.
ST_101	Ramp down in progress.
ST_102	Supplying in parallel with mains.
ST_104	Supplying.
ST_108	Emergency plant.
ST_109	Parallel to grid plant.
ST_112	Sync per second.
ST_113	Sync per minute.
ST_114	Sync per hour.
ST_127	Daylight Save Time.
ST_128	Generator automatic start request.
ST_129	Generator automatic start request for MCB closing failure.
ST_130	Generator automatic start request by "peak shaving".
ST_136	Generator stop request for none automatic start request.
ST_137	Generator stop request for unloading.
ST_138	Generator stop request for alarms.
ST_139	Manual stop request.
ST_140	Stop request for island mode inhibit.
ST_141	Stop request for some GCBs "not open".
ST_144	GCB closed on genset 01.
ST_145	GCB closed on genset 02.
ST_146	GCB closed on genset 03.
ST_147	GCB closed on genset 04.
ST_148	GCB closed on genset 05.
ST_149	GCB closed on genset 06.
ST_150	GCB closed on genset 07.
ST_151	GCB closed on genset 08.
ST_152	GCB closed on genset 09.
ST_153	GCB closed on genset 10.
ST_154	GCB closed on genset 11.
ST_155	GCB closed on genset 12.
ST_156	GCB closed on genset 13.
ST_157	GCB closed on genset 14.
ST_158	GCB closed on genset 15.
ST_159	GCB closed on genset 16.
ST_160	GCB closed on genset 17.
ST_161	GCB closed on genset 18.
ST_162	GCB closed on genset 19.
ST_163	GCB closed on genset 20.

Status	Description
ST_164	GCB closed on genset 21.
ST_165	GCB closed on genset 22.
ST_166	GCB closed on genset 23.
ST_167	GCB closed on genset 24.
ST_168	GCB closed on genset 25.
ST_169	GCB closed on genset 26.
ST_170	GCB closed on genset 27.
ST_171	GCB closed on genset 28.
ST_172	GCB closed on genset 29.
ST_173	GCB closed on genset 30.
ST_174	GCB closed on genset 31.
ST_175	GCB closed on genset 32.
ST_192	Unloading on genset 01.
ST_193	Unloading on genset 02.
ST_194	Unloading on genset 03.
ST_195	Unloading on genset 04.
ST_196	Unloading on genset 05.
ST_197	Unloading on genset 06.
ST_198	Unloading on genset 07.
ST_199	Unloading on genset 08.
ST_200	Unloading on genset 09.
ST_201	Unloading on genset 10.
ST_202	Unloading on genset 11.
ST_203	Unloading on genset 12.
ST_204	Unloading on genset 13.
ST_205	Unloading on genset 14.
ST_206	Unloading on genset 15.
ST_207	Unloading on genset 16.
ST_208	Unloading on genset 17.
ST_209	Unloading on genset 18.
ST_210	Unloading on genset 19.
ST_211	Unloading on genset 20.
ST_212	Unloading on genset 21.
ST_213	Unloading on genset 22.
ST_214	Unloading on genset 23.
ST_215	Unloading on genset 24.
ST_216	Unloading on genset 25.
ST_217	Unloading on genset 26.
ST_218	Unloading on genset 27.
ST_219	Unloading on genset 28.
ST_220	Unloading on genset 29.
ST_221	Unloading on genset 30.
ST_222	Unloading on genset 31.
ST_223	Unloading on genset 32.
ST_224	Calendar 1.
ST_225	Calendar 2.
ST_226	Calendar 3.
ST_227	Calendar 4.
ST_228	Calendar 5.
ST_229	Calendar 6.
ST_230	Calendar 7.
ST_231	Calendar 8.
ST_232	Calendar 9.
ST_233	Calendar 10.
ST_234	Calendar 11.
ST_235	Calendar 12.
ST_236	Calendar 13.
ST_237	Calendar 14.

Status	Description
ST_238	Calendar 15.
ST_239	Calendar 16.
ST_240	Genset 01 available.
ST_241	Genset 02 available.
ST_242	Genset 03 available.
ST_243	Genset 04 available.
ST_244	Genset 05 available.
ST_245	Genset 06 available.
ST_246	Genset 07 available.
ST_247	Genset 08 available.
ST_248	Genset 09 available.
ST_249	Genset 10 available.
ST_250	Genset 11 available.
ST_251	Genset 12 available.
ST_252	Genset 13 available.
ST_253	Genset 14 available.
ST_254	Genset 15 available.
ST_255	Genset 16 available.
ST_256	Genset 17 available.
ST_257	Genset 18 available.
ST_258	Genset 19 available.
ST_259	Genset 20 available.
ST_260	Genset 21 available.
ST_261	Genset 22 available.
ST_262	Genset 23 available.
ST_263	Genset 24 available.
ST_264	Genset 25 available.
ST_265	Genset 26 available.
ST_266	Genset 27 available.
ST_267	Genset 28 available.
ST_268	Genset 29 available.
ST_269	Genset 30 available.
ST_270	Genset 31 available.
ST_384	Generator 01 active on PMCB
ST_385	Generator 02 active on PMCB
ST_386	Generator 03 active on PMCB
ST_387	Generator 04 active on PMCB
ST_388	Generator 05 active on PMCB
ST_389	Generator 06 active on PMCB
ST_390	Generator 07 active on PMCB
ST_391	Generator 08 active on PMCB
ST_392	Generator 09 active on PMCB
ST_393	Generator 10 active on PMCB
ST_394	Generator 11 active on PMCB
ST_395	Generator 12 active on PMCB
ST_396	Generator 13 active on PMCB
ST_397	Generator 14 active on PMCB
ST_398	Generator 15 active on PMCB
ST_399	Generator 16 active on PMCB
ST_400	Generator 17 active on PMCB
ST_401	Generator 18 active on PMCB
ST_402	Generator 19 active on PMCB
ST_403	Generator 20 active on PMCB
ST_404	Generator 21 active on PMCB
ST_405	Generator 22 active on PMCB
ST_406	Generator 23 active on PMCB
ST_407	Generator 24 active on PMCB
ST_408	Generator 25 active on PMCB

Status	Description
ST_409	Generator 26 active on PMCB
ST_410	Generator 27 active on PMCB
ST_411	Generator 28 active on PMCB
ST_412	Generator 29 active on PMCB
ST_413	Generator 30 active on PMCB
ST_414	Generator 31 active on PMCB
ST_416	MC 01 active on PMCB
ST_417	MC 02 active on PMCB
ST_418	MC 03 active on PMCB
ST_419	MC 04 active on PMCB
ST_420	MC 05 active on PMCB
ST_421	MC 06 active on PMCB
ST_422	MC 07 active on PMCB
ST_423	MC 08 active on PMCB
ST_424	MC 09 active on PMCB
ST_425	MC 10 active on PMCB
ST_426	MC 11 active on PMCB
ST_427	MC 12 active on PMCB
ST_428	MC 13 active on PMCB
ST_429	MC 14 active on PMCB
ST_430	MC 15 active on PMCB
ST_431	MC 16 active on PMCB
ST_432	BTB 01 active on PMCB
ST_433	BTB 02 active on PMCB
ST_434	BTB 03 active on PMCB
ST_435	BTB 04 active on PMCB
ST_436	BTB 05 active on PMCB
ST_437	BTB 06 active on PMCB
ST_438	BTB 07 active on PMCB
ST_439	BTB 08 active on PMCB
ST_448	RN 01 active on PMCB
ST_449	RN 02 active on PMCB
ST_450	RN 03 active on PMCB
ST_451	RN 04 active on PMCB
ST_452	RN 05 active on PMCB
ST_453	RN 06 active on PMCB
ST_454	RN 07 active on PMCB
ST_455	RN 08 active on PMCB
ST_464	Validity of shared digital input 1
…	…
ST_719	Validity of shared digital input 256
ST_720	Validity of shared analogue input
…	…
ST_751	Validity of shared analogue input32
ST_997	PLC first scan.
ST_998	Always ON.
ST_999	Always OFF.

3.1.5.4 HS315 (rev. 01.24)

Status	Rev.	Description
ST_000	1.01	OFF_RESET
ST_001	1.01	MAN
ST_002	1.01	AUTO
ST_003	1.01	TEST
ST_004	1.01	AVVIAMENTO REMOTO
ST_006	1.05	Acknowledgment of anomalies in progress
ST_007	1.05	Reset of anomalies in progress

ST_008	1.01	Warnings
ST_009	1.01	Latched warnings
ST_010	1.01	Deactivations
ST_011	1.01	Alarms
ST_012	1.01	Not recognized warnings
ST_013	1.01	Not recognized latched warnings
ST_014	1.01	Not recognized deactivations
ST_015	1.01	Not recognized alarms
ST_016	1.01	Auxiliary source present (voltages/frequency)
ST_017	1.01	Auxiliary source absent or out of thresholds
ST_018	1.01	Delay for auxiliary source in thresholds
ST_019	1.01	Auxiliary source in thresholds
ST_020	1.01	Delay for Auxiliary source absent or out of thresholds
ST_024	1.01	Generator present (voltages/frequency)
ST_025	1.01	Generator absent or out of thresholds
ST_026	1.01	Delay for generator in thresholds
ST_027	1.01	Generator in thresholds
ST_028	1.01	Delay for generator absent or out of thresholds
ST_032	1.01	Engine running
ST_033	1.01	Lube oil protections enabled
ST_035	1.01	Engine management: stopped
ST_036	1.01	Engine management: starting
ST_037	1.01	Engine management: idle speed
ST_038	1.01	Engine management: delay before supply
ST_039	1.01	Engine management: ready to supply
ST_040	1.01	Engine management: cooling down
ST_041	1.01	Engine management: stopping
ST_060	1.01	GCB status
ST_061	1.01	BCB status
ST_062	1.01	LCB status
ST_063	1.01	ACB status
ST_064	1.01	GCB minimum voltage coil
ST_065	1.01	GCB opening pulse
ST_066	1.01	GCB closure pulse
ST_067	1.01	GCB closure command (stable)
ST_068	1.01	BCB minimum voltage coil
ST_069	1.01	BCB opening pulse
ST_070	1.01	BCB closure pulse
ST_071	1.01	BCB closure command (stable)
ST_072	1.01	LCB minimum voltage coil
ST_073	1.01	LCB opening pulse
ST_074	1.01	LCB closure pulse
ST_075	1.01	LCB closure command (stable)
ST_076	1.01	ACB minimum voltage coil
ST_077	1.01	ACB opening pulse
ST_078	1.01	ACB closure pulse
ST_079	1.01	ACB closure command (stable)
ST_080	1.01	Start inhibited by contact
ST_081	1.01	Start inhibited by clock/calendar
ST_088	1.01	GCB closure inhibited by contact
ST_090	1.01	GCB closure inhibited by serial port
ST_091	1.01	GCB closure inhibited by the protection of the circuit breaker
ST_093	1.01	GCB closure inhibited for battery disconnected
ST_094	1.01	GCB closure inhibited for voltage out of thresholds
ST_095	1.01	GCB closure inhibited for bus voltage out of thresholds
ST_096	1.01	Ready to supply
ST_104	1.01	Supplying
ST_112	1.01	Sync per second
ST_113	1.01	Sync per minute

ST_114	1.01	Sync per hour
ST_127	1.01	Daylight Save Time
ST_128	1.01	Glow-plugs preheat command
ST_129	1.01	ECU enable command
ST_130	1.01	Fuel solenoid
ST_131	1.01	Gas valve
ST_132	1.01	Crank motor
ST_133	1.01	Stop solenoid
ST_134	1.01	Idle speed command
ST_135	1.01	Coolant pre-heat command
ST_136	1.01	Pre-lubrication command
ST_137	1.05	Inhibit DPF regeneration
ST_138	1.05	Force DPF regeneration
ST_139	1.21	AdBlue pump command
ST_140	1.21	AdBlue solenoid command
ST_144	1.05	Plant battery charge: not in progress
ST_145	1.05	Plant battery charge: alignment of voltages
ST_146	1.05	Plant battery charge: BULK
ST_147	1.05	Plant battery charge: ABSORPTION
ST_148	1.05	Plant battery charge: FLOAT
ST_149	1.05	Plant battery charge: FLOAT terminated
ST_150	1.05	Plant battery charge: generator current regulation
ST_157	1.21	Forced regulation of generator current
ST_158	1.21	Limitation of the discharge current of the storage battery
ST_159	1.21	Limitation of the current of the generator
ST_224	1.01	Calendar 1
ST_225	1.01	Calendar 2
ST_226	1.01	Calendar 3
ST_227	1.01	Calendar 4
ST_228	1.01	Calendar 5
ST_229	1.01	Calendar 6
ST_230	1.01	Calendar 7
ST_231	1.01	Calendar 8
ST_232	1.01	Calendar 9
ST_233	1.01	Calendar 10
ST_234	1.01	Calendar 11
ST_235	1.01	Calendar 12
ST_236	1.01	Calendar 13
ST_237	1.01	Calendar 14
ST_238	1.01	Calendar 15
ST_239	1.01	Calendar 16
ST_240	1.01	Timer 1
ST_241	1.01	Timer 2
ST_242	1.01	Timer 3
ST_243	1.01	Timer 4
ST_256	1.05	CAN 0 BUS-OFF
ST_257	1.05	CAN 0 ERR-PASSIVE
ST_258	1.05	CAN 0 ERR-ACTIVE
ST_259	1.05	No communication on CAN 0
ST_304	1.05	START button
ST_305	1.05	STOP button
ST_306	1.05	GCB button
ST_308	1.05	MODE UP button
ST_309	1.05	MODE DOWN button
ST_310	1.05	UP button
ST_311	1.05	DOWN button
ST_312	1.05	LEFT button
ST_313	1.05	RIGHT button
ST_314	1.05	ENTER button

ST_315	1.05	EXIT button
ST_316	1.05	SHIFT button
ST_317	1.05	ACK button
ST_320	1.08	Status #01 from engine management by file
ST_321	1.08	Status #02 from engine management by file
ST_322	1.08	Status #03 from engine management by file
ST_323	1.08	Status #04 from engine management by file
ST_324	1.08	Status #05 from engine management by file
ST_325	1.08	Status #06 from engine management by file
ST_326	1.08	Status #07 from engine management by file
ST_327	1.08	Status #08 from engine management by file
ST_328	1.08	Status #09 from engine management by file
ST_329	1.08	Status #10 from engine management by file
ST_330	1.08	Status #11 from engine management by file
ST_331	1.08	Status #12 from engine management by file
ST_332	1.08	Status #13 from engine management by file
ST_333	1.08	Status #14 from engine management by file
ST_334	1.08	Status #15 from engine management by file
ST_335	1.08	Status #16 from engine management by file
ST_368	1.24	Active regeneration status: not active (spn3700=0)
ST_369	1.24	Active regeneration status: active (spn3700=1)
ST_370	1.24	Active regeneration status: will start soon (spn3700=2)
ST_371	1.24	DPF status: regeneration not required (spn3701=0)
ST_372	1.24	DPF status: regeneration needed - lowest level (spn3701=1)
ST_373	1.24	DPF status: regeneration needed - moderate level (spn3701=2)
ST_374	1.24	DPF status: regeneration needed - highest level (spn3701=3)
ST_480	1.05	Electronic battery #01: warnings
ST_496	1.05	Electronic battery #01: alarms
ST_512	1.05	Electronic battery #02: warnings
ST_528	1.05	Electronic battery #02: alarms
ST_544	1.05	Electronic battery #03: warnings
ST_560	1.05	Electronic battery #03: alarms
ST_576	1.05	Electronic battery #04: warnings
ST_592	1.05	Electronic battery #04: alarms
ST_608	1.05	Electronic battery #05: warnings
ST_624	1.05	Electronic battery #05: alarms
ST_640	1.05	Electronic battery #06: warnings
ST_656	1.05	Electronic battery #06: alarms
ST_672	1.05	Electronic battery #07: warnings
ST_688	1.05	Electronic battery #07: alarms
ST_704	1.05	Electronic battery #08: warnings
ST_720	1.05	Electronic battery #08: alarms
ST_736	1.05	Electronic battery #09: warnings
ST_752	1.05	Electronic battery #09: alarms
ST_768	1.05	Electronic battery #10: warnings
ST_784	1.05	Electronic battery #10: alarms
ST_800	1.05	Electronic battery #11: warnings
ST_816	1.05	Electronic battery #11: alarms
ST_832	1.05	Electronic battery #12: warnings
ST_848	1.05	Electronic battery #12: alarms
ST_864	1.05	Electronic battery #13: warnings
ST_880	1.05	Electronic battery #13: alarms
ST_896	1.05	Electronic battery #14: warnings
ST_912	1.05	Electronic battery #14: alarms
ST_928	1.05	Electronic battery #15: warnings
ST_944	1.05	Electronic battery #15: alarms
ST_960	1.05	Electronic battery #16: warnings
ST_976	1.05	Electronic battery #16: alarms
ST_997	1.01	PLC first scan

ST_998	1.01	Always ON
ST_999	1.01	Always OFF

3.1.5.5 RN200 rev. (01.08)

Status	Rev.	Description
ST.000	1.00	OFF_RESET
ST.001	1.00	MAN
ST.002	1.00	AUTO
ST.004	1.00	REMOTE START
ST.006	1.00	Acknowledgment of anomalies in progress
ST.007	1.00	Reset of anomalies in progress
ST.008	1.00	Warnings
ST.011	1.00	Alarms
ST.012	1.00	Not recognized warnings
ST.015	1.00	Not recognized alarms
ST.016	1.00	Voltage/frequency presence on bus bars
ST.017	1.00	Busbars out of tolerance
ST.018	1.00	Delay for bus bars in tolerance
ST.019	1.00	Busbars in tolerance
ST.020	1.00	Delay for bus bars out of tolerance.
ST.048	1.00	Presence of voltage on the loads
ST.049	1.00	Presence of voltage on the renewable sources
ST.064	1.00	GCB status
ST.065	1.00	MCB status
ST.066	1.00	MGCB status
ST.067	1.00	RNCB status
ST.069	1.00	RNCB closure command (stable)
ST.073	1.00	RNCB minimum voltage coil
ST.074	1.00	RNCB opening pulse
ST.075	1.00	RNCB closure pulse
ST.080	1.00	Start of inverters inhibited by contact
ST.081	1.00	Start of inverters inhibited by clock/calendar
ST.112	1.00	Sync per second
ST.113	1.00	Sync per minute
ST.114	1.00	Sync per hour
ST.127	1.00	Daylight Save Time
ST.128	1.00	Start request for inverters
ST.136	1.00	Inverters stop request (not required)
ST.138	1.00	Inverters stop request (alarms)
ST.139	1.00	Inverters stop request (MAN)
ST.144	1.00	GCB closed on genset 01
ST.145	1.00	GCB closed on genset 02
ST.146	1.00	GCB closed on genset 03
ST.147	1.00	GCB closed on genset 04
ST.148	1.00	GCB closed on genset 05
ST.149	1.00	GCB closed on genset 06
ST.150	1.00	GCB closed on genset 07
ST.151	1.00	GCB closed on genset 08
ST.152	1.00	GCB closed on genset 09
ST.153	1.00	GCB closed on genset 10
ST.154	1.00	GCB closed on genset 11
ST.155	1.00	GCB closed on genset 12
ST.156	1.00	GCB closed on genset 13
ST.157	1.00	GCB closed on genset 14
ST.158	1.00	GCB closed on genset 15
ST.159	1.00	GCB closed on genset 16
ST.160	1.00	GCB closed on genset 17
ST.161	1.00	GCB closed on genset 18

ST.162	1.00	GCB closed on genset 19
ST.163	1.00	GCB closed on genset 20
ST.164	1.00	GCB closed on genset 21
ST.165	1.00	GCB closed on genset 22
ST.166	1.00	GCB closed on genset 23
ST.167	1.00	GCB closed on genset 24
ST.168	1.00	GCB closed on genset 25
ST.169	1.00	GCB closed on genset 26
ST.170	1.00	GCB closed on genset 27
ST.171	1.00	GCB closed on genset 28
ST.172	1.00	GCB closed on genset 29
ST.173	1.00	GCB closed on genset 30
ST.174	1.00	GCB closed on genset 31
ST.175	1.00	GCB closed on genset 32
ST.192	1.00	Unloading on genset 01
ST.193	1.00	Unloading on genset 02
ST.194	1.00	Unloading on genset 03
ST.195	1.00	Unloading on genset 04
ST.196	1.00	Unloading on genset 05
ST.197	1.00	Unloading on genset 06
ST.198	1.00	Unloading on genset 07
ST.199	1.00	Unloading on genset 08
ST.200	1.00	Unloading on genset 09
ST.201	1.00	Unloading on genset 10
ST.202	1.00	Unloading on genset 11
ST.203	1.00	Unloading on genset 12
ST.204	1.00	Unloading on genset 13
ST.205	1.00	Unloading on genset 14
ST.206	1.00	Unloading on genset 15
ST.207	1.00	Unloading on genset 16
ST.208	1.00	Unloading on genset 17
ST.209	1.00	Unloading on genset 18
ST.210	1.00	Unloading on genset 19
ST.211	1.00	Unloading on genset 20
ST.212	1.00	Unloading on genset 21
ST.213	1.00	Unloading on genset 22
ST.214	1.00	Unloading on genset 23
ST.215	1.00	Unloading on genset 24
ST.216	1.00	Unloading on genset 25
ST.217	1.00	Unloading on genset 26
ST.218	1.00	Unloading on genset 27
ST.219	1.00	Unloading on genset 28
ST.220	1.00	Unloading on genset 29
ST.221	1.00	Unloading on genset 30
ST.222	1.00	Unloading on genset 31
ST.223	1.00	Unloading on genset 32
ST.224	1.00	Calendar 1
ST.225	1.00	Calendar 2
ST.226	1.00	Calendar 3
ST.227	1.00	Calendar 4
ST.228	1.00	Calendar 5
ST.229	1.00	Calendar 6
ST.230	1.00	Calendar 7
ST.231	1.00	Calendar 8
ST.232	1.00	Calendar 9
ST.233	1.00	Calendar 10
ST.234	1.00	Calendar 11
ST.235	1.00	Calendar 12
ST.236	1.00	Calendar 13

ST.237	1.00	Calendar 14
ST.238	1.00	Calendar 15
ST.239	1.00	Calendar 16
ST.240	1.00	Genset 01 available
ST.241	1.00	Genset 02 available
ST.242	1.00	Genset 03 available
ST.243	1.00	Genset 04 available
ST.244	1.00	Genset 05 available
ST.245	1.00	Genset 06 available
ST.246	1.00	Genset 07 available
ST.247	1.00	Genset 08 available
ST.248	1.00	Genset 09 available
ST.249	1.00	Genset 10 available
ST.250	1.00	Genset 11 available
ST.251	1.00	Genset 12 available
ST.252	1.00	Genset 13 available
ST.253	1.00	Genset 14 available
ST.254	1.00	Genset 15 available
ST.255	1.00	Genset 16 available
ST.256	1.00	Genset 17 available
ST.257	1.00	Genset 18 available
ST.258	1.00	Genset 19 available
ST.259	1.00	Genset 20 available
ST.260	1.00	Genset 21 available
ST.261	1.00	Genset 22 available
ST.262	1.00	Genset 23 available
ST.263	1.00	Genset 24 available
ST.264	1.00	Genset 25 available
ST.265	1.00	Genset 26 available
ST.266	1.00	Genset 27 available
ST.267	1.00	Genset 28 available
ST.268	1.00	Genset 29 available
ST.269	1.00	Genset 30 available
ST.270	1.00	Genset 31 available
ST.271	1.00	Genset 32 available
ST.272	1.00	CANBUS 0 (EXBUS) BUS-OFF
ST.273	1.00	CANBUS 0 (EXBUS) ERR-PASSIVE
ST.274	1.00	CANBUS 0 (EXBUS) ERR-ACTIVE
ST.275	1.00	No communication on CANBUS 0 (EXBUS)
ST.276	1.00	CANBUS 1 (PMCB) BUS-OFF
ST.277	1.00	CANBUS 1 (PMCB) ERR-PASSIVE
ST.278	1.00	CANBUS 1 (PMCB) ERR-ACTIVE
ST.279	1.00	No communication on CANBUS 1 (PMCB)
ST.280	1.00	CANBUS 2 (INT) BUS-OFF
ST.281	1.00	CANBUS 2 (INT) ERR-PASSIVE
ST.282	1.00	CANBUS 2 (INT) ERR-ACTIVE
ST.283	1.00	No communication on CANBUS 2 (INT)
ST.304	1.00	START button
ST.305	1.00	STOP button
ST.307	1.00	RNCB button
ST.308	1.00	MODE UP button
ST.309	1.00	MODE DOWN button
ST.310	1.00	UP button
ST.311	1.00	DOWN button
ST.312	1.00	LEFT button
ST.313	1.00	RIGHT button
ST.314	1.00	ENTER button
ST.315	1.00	EXIT button
ST.316	1.00	SHIFT button

ST.317	1.00	ACK button
ST_384	1.08	Generator 01 active on PMCB
ST_385	1.08	Generator 02 active on PMCB
ST_386	1.08	Generator 03 active on PMCB
ST_387	1.08	Generator 04 active on PMCB
ST_388	1.08	Generator 05 active on PMCB
ST_389	1.08	Generator 06 active on PMCB
ST_390	1.08	Generator 07 active on PMCB
ST_391	1.08	Generator 08 active on PMCB
ST_392	1.08	Generator 09 active on PMCB
ST_393	1.08	Generator 10 active on PMCB
ST_394	1.08	Generator 11 active on PMCB
ST_395	1.08	Generator 12 active on PMCB
ST_396	1.08	Generator 13 active on PMCB
ST_397	1.08	Generator 14 active on PMCB
ST_398	1.08	Generator 15 active on PMCB
ST_399	1.08	Generator 16 active on PMCB
ST_400	1.08	Generator 17 active on PMCB
ST_401	1.08	Generator 18 active on PMCB
ST_402	1.08	Generator 19 active on PMCB
ST_403	1.08	Generator 20 active on PMCB
ST_404	1.08	Generator 21 active on PMCB
ST_405	1.08	Generator 22 active on PMCB
ST_406	1.08	Generator 23 active on PMCB
ST_407	1.08	Generator 24 active on PMCB
ST_416	1.08	MC 01 active on PMCB
ST_417	1.08	MC 02 active on PMCB
ST_418	1.08	MC 03 active on PMCB
ST_419	1.08	MC 04 active on PMCB
ST_420	1.08	MC 05 active on PMCB
ST_421	1.08	MC 06 active on PMCB
ST_422	1.08	MC 07 active on PMCB
ST_423	1.08	MC 08 active on PMCB
ST_424	1.08	MC 09 active on PMCB
ST_425	1.08	MC 10 active on PMCB
ST_426	1.08	MC 11 active on PMCB
ST_427	1.08	MC 12 active on PMCB
ST_428	1.08	MC 13 active on PMCB
ST_429	1.08	MC 14 active on PMCB
ST_430	1.08	MC 15 active on PMCB
ST_431	1.08	MC 16 active on PMCB
ST_432	1.08	BTB 01 active on PMCB
ST_433	1.08	BTB 02 active on PMCB
ST_434	1.08	BTB 03 active on PMCB
ST_435	1.08	BTB 04 active on PMCB
ST_436	1.08	BTB 05 active on PMCB
ST_437	1.08	BTB 06 active on PMCB
ST_438	1.08	BTB 07 active on PMCB
ST_439	1.08	BTB 08 active on PMCB
ST_448	1.08	RN 01 active on PMCB
ST_449	1.08	RN 02 active on PMCB
ST_450	1.08	RN 03 active on PMCB
ST_451	1.08	RN 04 active on PMCB
ST_452	1.08	RN 05 active on PMCB
ST_453	1.08	RN 06 active on PMCB
ST_454	1.08	RN 07 active on PMCB
ST_455	1.08	RN 08 active on PMCB
ST_464	1.08	Validity of shared digital input 1
…	1.08	…

ST_719	1.08	Validity of shared digital input 256
ST_720	1.08	Validity of shared analogue input
…	1.08	…
ST_751	1.08	Validity of shared analogue input32
ST.997	1.00	PLC first scan
ST.998	1.00	Always ON
ST.999	1.00	Always OFF

3.1.5.6 BTB200 ver (01.10)

Stato	Ver.	Descrizione
ST.000	1.10	OFF_RESET
ST.001	1.10	MAN
ST.002	1.10	AUTO
ST.006	1.10	Identification ongoing anomalies
ST.007	1.10	Reset ongoing anomalies
ST.008	1.10	Warning total
ST.011	1.10	Blocks total
ST.012	1.10	Unacknowledged warnings total
ST.015	1.10	Unacknowledged blocks total
ST.016	1.10	Presence of BUS A voltage/frequency
ST.017	1.10	BUS A out of tolerance or off
ST.018	1.10	Delay for BUS A in tolerance
ST.019	1.10	BUS A in tolerance
ST.020	1.10	Delay for BUS A out of tolerance or off
ST.024	1.10	BUS B voltage/frequency present
ST.025	1.10	BUS B out of tolerance or absent
ST.026	1.10	Delay for BUS B within tolerance.
ST.027	1.10	BUS B in tolerance
ST.028	1.10	Delay for BUS B out of tolerance or absent
ST.064	1.10	BTB status
ST.068	1.10	BTB steady closing command
ST.070	1.10	BTB under voltage coil
ST.071	1.10	BTB pulse open command
ST.072	1.10	BTB pulse steady closing command
ST.096	1.10	Synchronization
ST.097	1.10	BUS A synchronization in progress
ST.098	1.10	BUS B synchronization in progress
ST.099	1.10	Synchronized
ST.112	1.10	Synchronization every second
ST.113	1.10	Synchronization every minute
ST.114	1.10	Synchronization every hour
ST.127	1.10	Daylight Save Time
ST.224	1.10	Calendar 1
ST.225	1.10	Calendar 2
ST.226	1.10	Calendar 3
ST.227	1.10	Calendar 4
ST.228	1.10	Calendar 5
ST.229	1.10	Calendar 6
ST.230	1.10	Calendar 7
ST.231	1.10	Calendar 8
ST.232	1.10	Calendar 9
ST.233	1.10	Calendar 10
ST.234	1.10	Calendar 11
ST.235	1.10	Calendar 12
ST.236	1.10	Calendar 13
ST.237	1.10	Calendar 14
ST.238	1.10	Calendar 15
ST.239	1.10	Calendar 16

ST.240	1.10	Timer 1
ST.241	1.10	Timer 2
ST.242	1.10	Timer 3
ST.243	1.10	Timer 4
ST.256	1.10	CAN 0 BUS-OFF
ST.257	1.10	CAN 0 ERR-PASSIVE
ST.258	1.10	CAN 0 ERR-ACTIVE
ST.259	1.10	No communication on CAN 0
ST.260	1.10	CAN 1 BUS-OFF
ST.261	1.10	CAN 1 ERR-PASSIVE
ST.262	1.10	CAN 1 ERR-ACTIVE
ST.263	1.10	No communication on CAN 1
ST.264	1.10	CAN 2 BUS-OFF
ST.265	1.10	CAN 2 ERR-PASSIVE
ST.266	1.10	CAN 2 ERR-ACTIVE
ST.267	1.10	No communication on CAN 2
ST.304	1.10	PROGRAM button
ST.305	1.10	HOME button
ST.306	1.10	BTB CLOSE button
ST.307	1.10	BTB OPEN button
ST.308	1.10	MODE UP button
ST.309	1.10	MODE DOWN button
ST.310	1.10	UP button
ST.311	1.10	DOWN button
ST.312	1.10	LEFT button
ST.313	1.10	RIGHT button
ST.314	1.10	ENTER button
ST.315	1.10	EXIT button
ST.316	1.10	SHIFT button
ST.317	1.10	ACK button
ST_384	1.10	Generator 01 active on PMCB
ST_385	1.10	Generator 02 active on PMCB
ST_386	1.10	Generator 03 active on PMCB
ST_387	1.10	Generator 04 active on PMCB
ST_388	1.10	Generator 05 active on PMCB
ST_389	1.10	Generator 06 active on PMCB
ST_390	1.10	Generator 07 active on PMCB
ST_391	1.10	Generator 08 active on PMCB
ST_392	1.10	Generator 09 active on PMCB
ST_393	1.10	Generator 10 active on PMCB
ST_394	1.10	Generator 11 active on PMCB
ST_395	1.10	Generator 12 active on PMCB
ST_396	1.10	Generator 13 active on PMCB
ST_397	1.10	Generator 14 active on PMCB
ST_398	1.10	Generator 15 active on PMCB
ST_399	1.10	Generator 16 active on PMCB
ST_400	1.10	Generator 17 active on PMCB
ST_401	1.10	Generator 18 active on PMCB
ST_402	1.10	Generator 19 active on PMCB
ST_403	1.10	Generator 20 active on PMCB
ST_404	1.10	Generator 21 active on PMCB
ST_405	1.10	Generator 22 active on PMCB
ST_406	1.10	Generator 23 active on PMCB
ST_407	1.10	Generator 24 active on PMCB
ST_408	1.10	Generator 25 active on PMCB
ST_409	1.10	Generator 26 active on PMCB
ST_410	1.10	Generator 27 active on PMCB
ST_411	1.10	Generator 28 active on PMCB
ST_412	1.10	Generator 29 active on PMCB

ST_413	1.10	Generator 30 active on PMCB
ST_414	1.10	Generator 31 active on PMCB
ST_416	1.10	MC 01 active on PMCB
ST_417	1.10	MC 02 active on PMCB
ST_418	1.10	MC 03 active on PMCB
ST_419	1.10	MC 04 active on PMCB
ST_420	1.10	MC 05 active on PMCB
ST_421	1.10	MC 06 active on PMCB
ST_422	1.10	MC 07 active on PMCB
ST_423	1.10	MC 08 active on PMCB
ST_424	1.10	MC 09 active on PMCB
ST_425	1.10	MC 10 active on PMCB
ST_426	1.10	MC 11 active on PMCB
ST_427	1.10	MC 12 active on PMCB
ST_428	1.10	MC 13 active on PMCB
ST_429	1.10	MC 14 active on PMCB
ST_430	1.10	MC 15 active on PMCB
ST_431	1.10	MC 16 active on PMCB
ST_432	1.10	BTB 01 active on PMCB
ST_433	1.10	BTB 02 active on PMCB
ST_434	1.10	BTB 03 active on PMCB
ST_435	1.10	BTB 04 active on PMCB
ST_436	1.10	BTB 05 active on PMCB
ST_437	1.10	BTB 06 active on PMCB
ST_438	1.10	BTB 07 active on PMCB
ST_439	1.10	BTB 08 active on PMCB
ST_448	1.10	RN 01 active on PMCB
ST_449	1.10	RN 02 active on PMCB
ST_450	1.10	RN 03 active on PMCB
ST_451	1.10	RN 04 active on PMCB
ST_452	1.10	RN 05 active on PMCB
ST_453	1.10	RN 06 active on PMCB
ST_454	1.10	RN 07 active on PMCB
ST_455	1.10	RN 08 active on PMCB
ST_464	1.10	Validity of shared digital input 1
…	1.10	…
ST_719	1.10	Validity of shared digital input 256
ST_720	1.10	Validity of shared analogue input
…	1.10	…
ST_751	1.10	Validity of shared analogue input32
ST.997	1.10	First PLC scan
ST.998	1.10	Always active
ST.999	1.10	Always not active

3.2 Numerical resources

The numerical resources are represented internally with the following formats:

- Format “0”: 31 bits with sign, without decimals (-2147483648 …+2147483647).
- Format “1”: 23 bits with sign, with 8-bit decimals (-8388608.00 …+8388607.99).

In the following, the description of the types and formats of the numerical resources.

3.2.1 AI - Analogue Inputs

The analogue inputs can be normally used as input resources only. The “virtual digital inputs” (part of the digital inputs) are exceptions, because they can be used also as output resources of the PLC blocks.

The format of the analogue inputs is always “1”.

There are three types of analogue inputs:

- **Analogue inputs of the controller**. They represent the values of the controller's "physical" analogue inputs. They are identified by the sign "AI_CONTROLLER_XX", where "XX" indicates the number (starting from 1) of the analogue input. The unit of measurement depends on the configuration parameters of the inputs and on the conversion curves (if present).
- **Virtual analogue inputs**. They do not correspond to any "physical" analogue input of the controller, but they are internal analogue values (thus they can be used as output resources); the controller manages them exactly as "physical" ones. They are identified by the sign "AI_VIRTUAL_XX", where "XX" indicates the number (starting from 1) of the virtual analogue input. The unit of measurement depends on the configuration parameters of the inputs and on the conversion curves (if present).
- **Shared analogue inputs**. They do not correspond to "analogue" input of the controller, but they are internal analogue values. They are generated only as output resources of the PLC blocks or received via CAN-Bus from the others controllers; the controller manages them exactly as "physical" ones. They are identified by the sign "AI_SHARED_XXX", where "XXX" indicates the number (starting from 1).
- **Analogue inputs of the expansion modules**. Two kinds of modules are managed:
  - **DITHERM / DIGRIN** modules acquire temperatures (thermocouples for DITHERM and PT100 for DIGRIN). Each module contains 3 analogue inputs. They are identified by the sign "AI_DITEMP_YY_XX", where "YY" is the number of the module, while "XX" indicates the number of the module's analogue input. Modules and inputs numbering starts from 1 ("AI_DITEMP_11_02" identifies the input 11 of the second module). The unit of measurement of these analogue inputs is always "°C".
  - **DIVIT** modules acquire 0-10 Vdc or 4-20 mA measurements. Each module contains 4 analogue inputs. They are identified by the sign "AI_DIVIT_YY_XX", where "YY" is the number of the module, while "XX" indicates the number of the module's analogue input. Modules and inputs numbering starts from 1 ("AI_ DIVIT_01_04" identifies the input 4 of the first DIVIT module). The unit of measurement depends on the configuration parameters of the inputs and on the conversion curves (if present).

3.2.2 AO - Analogue Outputs

The analogue outputs can be used as input or output resources for the PLC blocks. If they are used as outputs, you need to configure them as "Used by PLC" (function AIF.0101) in the parameters of the controller (parameter P.6001 and following).

The format of all analogue outputs is always "1" and the unit of measurement is always "%".

There are two types of analogue outputs:

- **Analogue outputs of the controller**. They represent the internal "physical" values of the controller's analogue outputs. They are identified by the sign "AO_CONTROLLER_XX", where "XX" indicates the number (starting from 1) of the analogue output.
- **Analogue outputs of the expansion modules** (DANOUT). They represent the internal "physical" values of the expansion modules' analogue outputs. Each module contains 4 analogue outputs. They are identified by the sign "AO_DANOUT_YY_XX", where "YY" indicates the number of the module, while "XX" indicates the number of the module's analogue output. Modules and inputs numbering starts from 1 ("AO_DANOUT_05_03" identifies the output 3 of the fourth DANOUT module).

3.2.3 AT – Numerical temporary support

The AT resources are numerical temporary memory included in the volatile memory of the controller; thus, they are set to zero at every system start. They can be used both as input and output resources of the PLC blocks. It's possible to create a "chain" of blocks where the same AT resource is the output of a block and becomes the input of the following PLC block.

If an AT resource is used as an output more than once, the compiler displays a warning (during compilation): it is in fact possible to reuse an AT resource several times as an output, but it is necessary to pay attention to the order of execution of the blocks, to ensure that each output value is correctly used by the next "cascade" block.

The unit of measurement and the format of each "AT" is assigned by the block that uses it as an output resource

They are identified by the sign "AT_XXX", where "XXX" indicates the number (starting from 1) of the temporary numerical resource.

3.2.4 AM - Controller Measurements

The AM resources represent the internal measurements of the controller (e.g. "Engine Speed") and can be used only as input resources for the PLC blocks. They can never be used as output resources.

The identifier is AM_XXX, where "XXX" is the index of the status required:

3.2.4.1 DST4602 (version 01.25)

Index	U.M.	U.M.	Format	Description
001	0.00	Hz	1	Generator frequency
002	0.00	Vac	1	Generator voltage L1-N
003	0.00	Vac	1	Generator voltage L2-N
004	0.00	Vac	1	Generator voltage L3-N
005	0.00	Vac	1	Generator voltage N-Battery
006	0.00	Vac	1	Generator voltage L1-L2
007	0.00	Vac	1	Generator voltage L2-L3
008	0.00	Vac	1	Generator voltage L3-L1
009	0.00	Vac	1	Generator voltage L-L average
012	0.00	Hz	1	Mains/bus bars frequency
013	0.00	Vac	1	Mains/bus bars voltage L1-N
014	0.00	Vac	1	Mains/bus bars voltage L2-N
015	0.00	Vac	1	Mains/bus bars voltage L3-N
016	0.00	Vac	1	Mains/bus bars voltage N-Battery
017	0.00	Vac	1	Mains/bus bars voltage L1-L2
018	0.00	Vac	1	Mains/bus bars voltage L2-L3
019	0.00	Vac	1	Mains/bus bars voltage L3-L1
020	0.00	Vac	1	Mains/bus bars voltage L-L average
023	0.00	Aac	1	Current L1
024	0.00	Aac	1	Current L2
025	0.00	Aac	1	Current L3
026	0.00	Aac	1	Auxiliary current (or neutral current)
027	0.00	Aac	1	Differential current
030	0.00	kW	0	Nominal active power
031	0.00	kW	1	Active power L1
032	0.00	kW	1	Active power L2
033	0.00	kW	1	Active power L3
034	0.00	kW	1	Total active power
037	0.00	kVA	0	Nominal apparent power
038	0.00	kVA	1	Apparent power L1
039	0.00	kVA	1	Apparent power L2
040	0.00	kVA	1	Apparent power L3

Index	U.M.	U.M.	Format	Description
041	0.00	kVA	1	Total apparent power
044	0.00	kvar	1	Reactive power L1
045	0.00	kvar	1	Reactive power L2
046	0.00	kvar	1	Reactive power L3
047	0.00	kvar	1	Total reactive power
050	0.00	kvar	1	Reactive power L1 (calculated from kW and kVA)
051	0.00	kvar	1	Reactive power L2 (calculated from kW and kVA)
052	0.00	kvar	1	Reactive power L3 (calculated from kW and kVA)
055	0.00	-	1	Power factor L1 (calculated from kW and kVA)
056	0.00	-	1	Power factor L2 (calculated from kW and kVA)
057	0.00	-	1	Power factor L3 (calculated from kW and kVA)
058	0.00	-	1	Total power factor (calculated from kW and kVA)
059	0.00	-	1	Total Cos(?) (calculated from kW and kvar)
062	0.00	kWh	0	Generator active energy (total)
063	0.00	kWh	0	Generator active energy (partial)
064	0.00	kvarh	0	Generator reactive energy (total)
065	0.00	kvarh	0	Generator reactive energy (partial)
068	0.00	kWh	0	Mains/bus bars active energy (total)
069	0.00	kWh	0	Mains/bus bars active energy (partial)
070	0.00	kvarh	0	Mains/bus bars reactive energy (total)
071	0.00	kvarh	0	Mains/bus bars reactive energy (partial)
074	0.00	kW	1	Active power on the mains
075	0.00	kW	1	Active power on the loads
076	0.00	kW	1	Active power on the parallel bus bars
077	0.00	kW	0	Nominal power on the parallel bus bars
080	0.00	kW	1	Required power (final)
081	0.00	kW	1	Required power (actual)
082	0.00	%	1	Speed regulator command
085	0.00	kvar	1	Reactive power required (actual)
086	0.00	%	1	Voltage regulator command
088	0.00	rpm	0	Engine speed (spn 190 - SAE J1939)
091	0.00	%	1	Engine oil level (spn 98 - SAE J1939)
092	0.00	%	1	Engine coolant level (spn 111 - SAE J1939)
093	0.00	%	1	Engine fuel level (%)
094	0.98	Lt	1	Engine fuel level (L)
096	0.00	L/H	1	Engine fuel rate (actual) (spn 183 - SAE J1939)
097	0.00	L/H	1	Engine fuel rate (average) (spn 1029 - SAE J1939)
100	0.00	L	0	Engine fuel used (total) (spn 250 - SAE J1939)
101	0.00	L	0	Engine fuel used (partial) (spn 182 - SAE J1939)
104	0.00	Vdc	1	Battery voltage (ECU) (spn 158 or 168 - SAE J1939)
105	0.00	Vdc	1	Battery voltage (controller)
107	0.63	-	0	Engine diagnostic code (ECU)
108	0.00	-	0	Engine number of starts (controller)
111	0.00	H	0	Engine total hours of operation (ECU) (spn 247 - SAE J1939)
112	0.00	H	0	Engine hours of operation (controller) (total)
113	0.00	H	0	Engine hours of operation (controller) (partial)
114	0.00	H	0	Engine hours of operation with GCB closed (controller) (partial)
115	0.00	H	0	Engine hours of operation with protections disabled (controller) (partial)
116	0.00	H	0	Engine hours to maintenance (controller) (partial)
117	0.00	H	0	Controller hours of operation
118	0.98	H	0	Engine hours to maintenance 2 (controller) (partial)
119	0.98	H	0	Days to maintenance (controller)
120	0.00	bar	1	Barometric pressure (spn 108 - SAE J1939)
121	0.00	bar	1	Engine oil pressure (spn 100 - SAE J1939)
122	0.00	bar	1	Engine coolant pressure (spn 109 - SAE J1939)
123	0.00	bar	1	Engine fuel delivery pressure (spn 94 - SAE J1939)
124	0.00	bar	1	Engine injector timing rail pressure (spn 156 - SAE J1939)

Index	U.M.	U.M.	Format	Description
125	0.00	bar	1	Engine injector metering rail pressure (spn 157 - SAE J1939)
126	0.00	bar	1	Engine intake manifold pressure (spn 102 or 3563 - SAE J1939)
127	0.92	bar	1	Engine oil pressure 2
128	1.10	bar	1	Engine inlet air pressure (spn 106 - SAE J1939)
134	0.00	°C	1	Ambient air temperature (spn 171 - SAE J1939)
135	0.00	°C	1	Engine ECU temperature (spn 1136 - SAE J1939)
136	0.00	°C	1	Engine oil temperature (spn 175 - SAE J1939)
137	0.00	°C	1	Engine coolant temperature (spn 110 - SAE J1939)
138	0.00	°C	1	Engine fuel temperature (spn 174 - SAE J1939)
139	0.00	°C	1	Engine intake manifold temperature (spn 105 - SAE J1939)
140	0.00	°C	1	Engine turbocharger compressor outlet temperature (spn 2629 - SAE J1939)
141	0.00	°C	1	Engine exhaust gas temperature - Left manifold (spn 2434 - SAE J1939)
142	0.00	°C	1	Engine exhaust gas temperature - Right manifold (spn 2433 - SAE J1939)
143	0.00	°C	1	Engine intercooler temperature (spn 52 - SAE J1939)
144	0.00	°C	1	Engine alternator bearing 1 temperature (left or rear) (spn 1122 - SAE J1939)
145	0.00	°C	1	Engine alternator bearing 2 temperature (right or front) (spn 1123 - SAE J1939)
146	0.00	°C	1	Engine alternator winding 1 temperature (spn 1124 - SAE J1939)
147	0.00	°C	1	Engine alternator winding 2 temperature (spn 1125 - SAE J1939)
148	0.00	°C	1	Engine alternator winding 3 temperature (spn 1126 - SAE J1939)
149	0.26	°C	1	Auxiliary temperature 1 (spn 441 - SAE J1939)
150	0.26	°C	1	Auxiliary temperature 2 (spn 442 - SAE J1939)
151	0.92	°C	1	Engine oil temperature 2 (spn 1135 - SAE J1939)
152	0.92	°C	1	Engine coolant temperature 2
153	1.02	%	1	DPF soot load % (spn 3719 - SAE J1939)
154	1.02	%	1	DPF ash load % (spn 3720 - SAE J1939)
155	1.02	s	0	DPF time since last regeneration s (spn 3721 - SAE J1939)
156	1.02	%	1	SCR catalyst tank level % (spn 1761 - SAE J1939)
157	1.02	°C	1	SCR catalyst tank temperature (spn 3031 - SAE J1939)
158	1.02	°C	1	DPF outlet gas temperature (spn 3246 - SAE J1939)
159	1.02	°C	1	DPF exhaust gas temperature (spn 3241 - SAE J1939)
160	1.02	°C	1	DPF inlet gas temperature (spn 3242 - SAE J1939)
161	0.89	-	0	Pulses counter #1
162	0.89	-	0	Pulses counter #2
163	0.89	-	0	Pulses counter #3
164	0.89	-	0	Pulses counter #4
165	0.89	-	0	Pulses counter #5
166	0.89	-	0	Pulses counter #6
167	0.89	-	0	Pulses counter #7
168	0.89	-	0	Pulses counter #8
173	0.94	Hz	1	D-PRO: frequency
174	0.94	Vac	1	D-PRO: L1-N voltage
175	0.94	Vac	1	D-PRO: L2-N voltage
176	0.94	Vac	1	D-PRO: L3-N voltage
177	0.94	Vac	1	D-PRO: N-B voltage
178	0.94	Vac	1	D-PRO: L1-L2 voltage
179	0.94	Vac	1	D-PRO: L2-L3 voltage
180	0.94	Vac	1	D-PRO: L3-L1 voltage
181	0.94	Vac	1	D-PRO: L-L average voltage
182	0.94	Vac	1	D-PRO: homopolar voltage
183	0.94	Aac	1	D-PRO: L1 current (A)
184	0.94	Aac	1	D-PRO: L2 current (A)
185	0.94	Aac	1	D-PRO: L3 current (A)
186	0.94	Aac	1	D-PRO: L1 current (B)

Index	U.M.	U.M.	Format	Description
187	0.94	Aac	1	D-PRO: L2 current (B)
188	0.94	Aac	1	D-PRO: L3 current (B)
189	0.94	Aac	1	D-PRO: auxiliary current (from C.T.)
190	0.94	Aac	1	D-PRO: auxiliary current (from toroid)
191	0.94	Aac	1	D-PRO: negative sequence current (B)
192	0.94	Aac	1	D-PRO: positive sequence current (B)
193	0.94	Aac	1	D-PRO: L1 differential current (A - B)
194	0.94	Aac	1	D-PRO: L2 differential current (A - B)
195	0.94	Aac	1	D-PRO: L3 differential current (A - B)
196	0.94	Aac	1	D-PRO: L1 average current ((A + B) / 2)
197	0.94	Aac	1	D-PRO: L2 average current ((A + B) / 2)
198	0.94	Aac	1	D-PRO: L3 average current ((A + B) / 2)
199	0.94	kW	1	D-PRO: total active power (B)
200	0.94	kvar	1	D-PRO: total reactive power (B)
201	0.94	Vdc	1	D-PRO: power supply voltage
202	0.94	Aac	1	D-PRO: neutral current
203	0.94	Aac	1	D-PRO: differential current (on A or on B)
209	1.10	-	1	Generic measure #1 from the engine (unsigned)
210	1.10	-	1	Generic measure #2 from the engine (unsigned)
211	1.10	-	1	Generic measure #3 from the engine (unsigned)
212	1.10	-	1	Generic measure #4 from the engine (unsigned)
213	1.10	-	1	Generic measure #5 from the engine (unsigned)
214	1.10	-	1	Generic measure #6 from the engine (unsigned)
215	1.10	-	1	Generic measure #7 from the engine (unsigned)
216	1.10	-	1	Generic measure #8 from the engine (unsigned)
217	1.10	-	1	Generic measure #1 from the engine (signed)
218	1.10	-	1	Generic measure #2 from the engine (signed)
219	1.10	-	1	Generic measure #3 from the engine (signed)
220	1.10	-	1	Generic measure #4 from the engine (signed)
221	1.10	-	1	Generic measure #5 from the engine (signed)
222	1.10	-	1	Generic measure #6 from the engine (signed)
223	1.10	-	1	Generic measure #7 from the engine (signed)
224	1.10	-	1	Generic measure #8 from the engine (signed)
225	1.14	-	0	Particulate trap lamp command (spn 3697 - SAE J1939)
226	1.14	-	0	Particulate trap status (spn 3701 - SAE J1939)
227	1.14	-	0	Particulate trap active regeneration status (spn 3700 - SAE J1939)
228	1.14	-	0	Particulate trap passive regeneration status (spn 3699 - SAE J1939)
229	1.14	-	0	Particulate trap manual regeneration status
230	1.14	-	0	Particulate trap active regeneration inhibithed by user (spn 3703 - SAE J1939)
231	1.14	-	0	Exhaust system high temperature lamp command (spn 3698 - SAE J1939)
232	1.14	-	0	DEF Tank 1 Low Level Indicator (spn 5245 - SAE J1939)
233	1.25		0	spn 6915: (64586) SCR System Cleaning Lamp Command
234	1.25		0	spn 6918: (64586) SCR System Cleaning Inhibited Due to Inhibit Switch

3.2.4.2 GC600 (version 01.52)

Index	Rev.	U.M.	Format	Description
001	1.00	Hz	1	*Generator frequency*
002	1.00	Vac	1	*Generator voltage L1-N*
003	1.00	Vac	1	*Generator voltage L2-N*
004	1.00	Vac	1	*Generator voltage L3-N*
005	1.00	Vac	1	*Generator voltage N-Battery*
006	1.00	Vac	1	*Generator voltage L1-L2*
007	1.00	Vac	1	*Generator voltage L2-L3*
008	1.00	Vac	1	*Generator voltage L3-L1*

009	1.00	Vac	1	*Generator voltage L-L average*
012	1.00	Hz	1	*Mains/bus bars frequency*
013	1.00	Vac	1	*Mains/bus bars voltage L1-N*
014	1.00	Vac	1	*Mains/bus bars voltage L2-N*
015	1.00	Vac	1	*Mains/bus bars voltage L3-N*
016	1.00	Vac	1	*Mains/bus bars voltage N-Battery*
017	1.00	Vac	1	*Mains/bus bars voltage L1-L2*
018	1.00	Vac	1	*Mains/bus bars voltage L2-L3*
019	1.00	Vac	1	*Mains/bus bars voltage L3-L1*
020	1.00	Vac	1	*Mains/bus bars voltage L-L average*
023	1.00	Aac	1	*Current L1*
024	1.00	Aac	1	*Current L2*
025	1.00	Aac	1	*Current L3*
026	1.00	Aac	1	*Auxiliary current (or neutral current)*
027	1.00	Aac	1	*Differential current*
030	1.00	kW	0	*Nominal active power*
031	1.00	kW	1	*Active power L1*
032	1.00	kW	1	*Active power L2*
033	1.00	kW	1	*Active power L3*
034	1.00	kW	1	*Total active power*
037	1.00	kVA	0	*Nominal apparent power*
038	1.00	kVA	1	*Apparent power L1*
039	1.00	kVA	1	*Apparent power L2*
040	1.00	kVA	1	*Apparent power L3*
041	1.00	kVA	1	*Total apparent power*
044	1.00	kvar	1	*Reactive power L1*
045	1.00	kvar	1	*Reactive power L2*
046	1.00	kvar	1	*Reactive power L3*
047	1.00	kvar	1	*Total reactive power*
055	1.00	-	1	*Power factor L1 (calculated from kW and kVA)*
056	1.00	-	1	*Power factor L2 (calculated from kW and kVA)*
057	1.00	-	1	*Power factor L3 (calculated from kW and kVA)*
058	1.00	-	1	*Total power factor (calculated from kW and kVA)*
059	1.00	-	1	*Total Cos(phi) (calculated from kW and kvar)*
062	1.00	kWh	0	*Generator active energy (total)*
063	1.00	kWh	0	*Generator active energy (partial)*
064	1.00	kvarh	0	*Generator reactive energy (total)*
065	1.00	kvarh	0	*Generator reactive energy (partial)*
068	1.00	kWh	0	*Mains/bus bars active energy (total)*
069	1.00	kWh	0	*Mains/bus bars active energy (partial)*
070	1.00	kvarh	0	*Mains/bus bars reactive energy (total)*
071	1.00	kvarh	0	*Mains/bus bars reactive energy (partial)*
074	1.00	kW	1	*Active power on the mains*
075	1.00	kW	1	*Active power on the loads*
076	1.00	kW	1	*Active power on the parallel bus bars*
077	1.00	kW	0	*Nominal power on the parallel bus bars*
080	1.00	kW	1	*Required power (final)*
081	1.00	kW	1	*Required power (actual)*
082	1.00	%	1	*Speed regulator command*
085	1.00	kvar	1	*Reactive power required (actual)*
086	1.00	%	1	*Voltage regulator command*
088	1.00	rpm	0	*Engine speed (spn 190 - SAE J1939)*
091	1.00	%	1	*Engine oil level (spn 98 - SAE J1939)*
092	1.00	%	1	*Engine coolant level (spn 111 - SAE J1939)*
093	1.00	%	1	*Engine fuel level (%)*
094	1.00	L	1	*Engine fuel level (L)*
096	1.00	L/H	1	*Engine fuel rate (actual) (spn 183 - SAE J1939)*
097	1.00	L/H	1	*Engine fuel rate (average) (spn 1029 - SAE J1939)*
100	1.00	L	0	*Engine fuel used (total) (spn 250 - SAE J1939)*

101	1.00	L	0	*Engine fuel used (partial) (spn 182 - SAE J1939)*
104	1.00	Vdc	1	*Battery voltage (ECU) (spn 158 or 168 - SAE J1939)*
105	1.00	Vdc	1	*Battery voltage (controller)*
107	1.00	-	0	*MTU diagnostic code (ECU)*
108	1.00	-	0	*Engine number of starts (controller)*
111	1.00	H	0	*Engine total hours of operation (ECU) (spn 247 - SAE J1939)*
112	1.00	H	0	*Engine hours of operation (controller) (total)*
113	1.00	H	0	*Engine hours of operation (controller) (partial)*
114	1.00	H	0	*Engine hours of operation with GCB closed (controller) (partial)*
115	1.00	H	0	*Engine hours of operation with protections disabled (controller) (partial)*
116	1.00	H	0	*Engine hours to maintenance 1 (controller) (partial)*
117	1.00	H	0	*Controller hours of operation*
118	1.00	H	0	*Engine hours to maintenance 2 (controller) (partial)*
119	1.00	H	0	*Days to maintenance (controller)*
120	1.00	bar	1	*Barometric pressure (spn 108 - SAE J1939)*
121	1.00	bar	1	*Engine oil pressure (spn 100 - SAE J1939)*
122	1.00	bar	1	*Engine coolant pressure (spn 109 - SAE J1939)*
123	1.00	bar	1	*Engine fuel delivery pressure (spn 94 - SAE J1939)*
124	1.00	bar	1	*Engine injector timing rail pressure (spn 156 - SAE J1939)*
125	1.00	bar	1	*Engine injector metering rail pressure (spn 157 - SAE J1939)*
126	1.00	bar	1	*Engine intake manifold pressure (spn 102 or 3563 - SAE J1939)*
127	1.16	bar	1	Engine oil pressure 2
128	1.32	bar	1	Engine inlet air pressure (spn 106 - SAE J1939)
134	1.00	°C	1	*Ambient air temperature (spn 171 - SAE J1939)*
135	1.00	°C	1	*Engine ECU temperature (spn 1136 - SAE J1939)*
136	1.00	°C	1	*Engine oil temperature (spn 175 - SAE J1939)*
137	1.00	°C	1	*Engine coolant temperature (spn 110 - SAE J1939)*
138	1.00	°C	1	*Engine fuel temperature (spn 174 - SAE J1939)*
139	1.00	°C	1	*Engine intake manifold temperature (spn 105 - SAE J1939)*
140	1.00	°C	1	*Engine turbocharger compressor outlet temperature (spn 2629 - SAE J1939)*
141	1.00	°C	1	*Engine exhaust gas temperature - Left manifold (spn 2434 - SAE J1939)*
142	1.00	°C	1	*Engine exhaust gas temperature - Right manifold (spn 2433 - SAE J1939)*
143	1.00	°C	1	*Engine intercooler temperature (spn 52 - SAE J1939)*
144	1.00	°C	1	*Engine alternator bearing 1 temperature (left or rear) (spn 1122 - SAE J1939)*
145	1.00	°C	1	*Engine alternator bearing 2 temperature (right or front) (spn 1123 - SAE J1939)*
146	1.00	°C	1	*Engine alternator winding 1 temperature (spn 1124 - SAE J1939)*
147	1.00	°C	1	*Engine alternator winding 2 temperature (spn 1125 - SAE J1939)*
148	1.00	°C	1	*Engine alternator winding 3 temperature (spn 1126 - SAE J1939)*
149	1.00	°C	1	*Auxiliary temperature 1 (spn 441 - SAE J1939)*
150	1.00	°C	1	*Auxiliary temperature 2 (spn 442 - SAE J1939)*
151	1.00	°C	1	*Engine oil temperature 2 (spn 1135 - SAE J1939)*
152	1.00	°C	1	*Engine coolant temperature 2*
153	1.00	%	1	*DPF soot load % (spn 3719 - SAE J1939)*
154	1.00	%	1	*DPF ash load % (spn 3720 - SAE J1939)*
155	1.00	s	0	*DPF time since last regeneration s (spn 3721 - SAE J1939)*
156	1.00	%	1	*SCR catalyst tank level % (spn 1761 - SAE J1939)*
157	1.00	°C	1	*SCR catalyst tank temperature (spn 3031 - SAE J1939)*
158	1.00	°C	1	*DPF outlet gas temperature (spn 3246 - SAE J1939)*
159	1.00	°C	1	*DPF exhaust gas temperature (spn 3241 - SAE J1939)*
160	1.00	°C	1	*DPF inlet gas temperature (spn 3242 - SAE J1939)*
161	1.19		0	*Pulses counter #1*
162	1.19		0	*Pulses counter #2*
163	1.19		0	*Pulses counter #3*

164	1.19		0	*Pulses counter #4*
165	1.19		0	*Pulses counter #5*
166	1.19		0	*Pulses counter #6*
167	1.19		0	*Pulses counter #7*
168	1.19		0	*Pulses counter #8*
209	1.21		1	*Measure #01 (without sign) from engine management by file*
210	1.21		1	*Measure #02 (without sign) from engine management by file*
211	1.21		1	*Measure #03 (without sign) from engine management by file*
212	1.21		1	*Measure #04 (without sign) from engine management by file*
213	1.21		1	*Measure #05 (without sign) from engine management by file*
214	1.21		1	*Measure #06 (without sign) from engine management by file*
215	1.21		1	*Measure #07 (without sign) from engine management by file*
216	1.21		1	*Measure #08 (without sign) from engine management by file*
217	1.21		1	*Measure #01 (with sign) from engine management by file*
218	1.21		1	*Measure #02 (with sign) from engine management by file*
219	1.21		1	*Measure #03 (with sign) from engine management by file*
220	1.21		1	*Measure #04 (with sign) from engine management by file*
221	1.21		1	*Measure #05 (with sign) from engine management by file*
222	1.21		1	*Measure #06 (with sign) from engine management by file*
223	1.21		1	*Measure #07 (with sign) from engine management by file*
224	1.21		1	*Measure #08 (with sign) from engine management by file*
225	1.32	-	0	Particulate trap lamp command (spn 3697 - SAE J1939)
226	1.32	-	0	Particulate trap status (spn 3701 - SAE J1939)
227	1.32	-	0	Particulate trap active regeneration status (spn 3700 - SAE J1939)
228	1.32	-	0	Particulate trap passive regeneration status (spn 3699 - SAE J1939)
229	1.32	-	0	Particulate trap manual regeneration status
230	1.32	-	0	Particulate trap active regeneration inhibithed by user (spn 3703 - SAE J1939)
231	1.32	-	0	Exhaust system high temperature lamp command (spn 3698 - SAE J1939)
232	1.32	-	0	DEF Tank 1 Low Level Indicator (spn 5245 - SAE J1939)
233	1.32		0	spn 6915: (64586) SCR System Cleaning Lamp Command
234	1.32		0	spn 6918: (64586) SCR System Cleaning Inhibited Due to Inhibit Switch

3.2.4.3 MC200 (rev. 01.26)

Index	U.M.	Format	Description
001	Hz	1	*Frequency*
002	Vac	1	*Generator/bus bars voltage L1-N*
003	Vac	1	*Generator/bus bars voltage L2-N*
004	Vac	1	*Generator/bus bars voltage L3-N*
005	Vac	1	*Generator/bus bars voltage N-Battery*
006	Vac	1	*Generator/bus bars voltage L1-L2*
007	Vac	1	*Generator/bus bars voltage L2-L3*
008	Vac	1	*Generator/bus bars voltage L3-L1*
009	Vac	1	*Generator/bus bars voltage L-L average*
012	Hz	1	*Mains frequency*
013	Vac	1	*Mains voltage L1-N*
014	Vac	1	*Mains voltage L2-N*
015	Vac	1	*Mains voltage L3-N*
016	Vac	1	*Mains voltage N-Battery*
017	Vac	1	*Mains voltage L1-L2*
018	Vac	1	*Mains voltage L2-L3*
019	Vac	1	*Mains voltage L3-L1*
020	Vac	1	*Mains voltage L-L average*
023	Aac	1	*Current L1*
024	Aac	1	*Current L2*
025	Aac	1	*Current L3*

Index	U.M.	Format	Description
026	Aac	1	*Auxiliary current (or neutral current)*
031	kW	1	*Active power L1*
032	kW	1	*Active power L2*
033	kW	1	*Active power L3*
034	kW	1	*Total active power*
038	kVA	1	*Apparent power L1*
039	kVA	1	*Apparent power L2*
040	kVA	1	*Apparent power L3*
041	kVA	1	*Total apparent power*
044	kvar	1	*Reactive power L1*
045	kvar	1	*Reactive power L2*
046	kvar	1	*Reactive power L3*
047	kvar	1	*Total reactive power*
055	-	1	*Power factor L1 (calculated from kW and kVA)*
056	-	1	*Power factor L2 (calculated from kW and kVA)*
057	-	1	*Power factor L3 (calculated from kW and kVA)*
058	-	1	*Total power factor (calculated from kW and kVA)*
059	-	1	*Total Cos(phi) (calculated from kW and kvar)*
062	kWh	0	*Generator/bus bars active exported energy (total)*
063	kWh	0	*Generator/bus bars active exported energy (partial)*
064	kvarh	0	*Generator/bus bars reactive exported energy (total)*
065	kvarh	0	*Generator/bus bars reactive exported energy (partial)*
068	kWh	0	*Mains active exported energy (total)*
069	kWh	0	*Mains active exported energy (partial)*
070	kvarh	0	*Mains reactive exported energy (total)*
071	kvarh	0	*Mains reactive exported energy (partial)*
074	kW	1	*Active power on the mains*
075	kW	1	*Active power on the loads*
076	kW	1	*Active power on the parallel bus bars*
077	kW	1	*Active power on the MGCB*
082	%	1	*Speed regulator command*
086	%	1	*Voltage regulator command*
094	kvarh	0	*Generator/bus active imported energy (total)*
095	kvarh	0	*Generator/bus active imported energy (partial)*
098	kWh	0	*Generator/bus reactive imported energy (total)*
099	kWh	0	*Generator/bus reactive imported energy (partial)*
100	kvarh	0	*Mains active imported energy (total)*
101	kvarh	0	*Mains active imported energy (partial)*
105	Vdc	1	*Mains reactive imported energy (total)*
117	H	0	*Mains reactive imported energy (partial)*

3.2.4.4 HS315 (rev. 01.20)

Index	Rev.	U.M.	Format	Description
001	1.01	Hz	1	*Generator frequency*
002	1.01	Vac	1	*Generator voltage L1-N*
003	1.01	Vac	1	*Generator voltage L2-N*
004	1.01	Vac	1	*Generator voltage L3-N*
005	1.01	Vac	1	*Generator voltage N-Battery*
006	1.01	Vac	1	*Generator voltage L1-L2*
007	1.01	Vac	1	*Generator voltage L2-L3*
008	1.01	Vac	1	*Generator voltage L3-L1*
009	1.01	Vac	1	*Generator voltage L-L average*
012	1.01	Hz	1	*Auxiliary source frequency*
013	1.01	Vac	1	*Auxiliary source voltage L1-N*
014	1.01	Vac	1	*Auxiliary source voltage L2-N*
015	1.01	Vac	1	*Auxiliary source voltage L3-N*
016	1.01	Vac	1	*Auxiliary source voltage N-Battery*

017	1.01	Vac	1	*Auxiliary source voltage L1-L2*
018	1.01	Vac	1	*Auxiliary source voltage L2-L3*
019	1.01	Vac	1	*Auxiliary source voltage L3-L1*
020	1.01	Vac	1	*Auxiliary source voltage L-L average*
023	1.01	Aac	1	*Generator current*
024	1.01	Aac	1	*Battery current*
025	1.01	Aac	1	*Load current*
026	1.01	Aac	1	*Auxiliary current*
031	1.01	kW	1	*Power of the generator*
032	1.01	kW	1	*Power of the battery*
033	1.01	kW	1	*Power of the loads*
034	1.01	kW	1	*Power of the auxiliary source*
038	1.20	Aac	1	*DC current 1*
039	1.20	Aac	1	*DC current 2*
040	1.20	Aac	1	*DC current 3*
041	1.20	Aac	1	*DC current 4*
044	1.01	kvar	1	*Generator voltage DC*
045	1.01	kvar	1	*Battery voltage DC*
046	1.01	kvar	1	*Load voltage DC*
047	1.01	kvar	1	*Auxiliary voltage DC*
049	1.01	Ah	1	*Battery charge level*
050	1.01	°C	1	*Battery temperature*
086	1.05	%	1	*Command for battery charge voltage regulation*
088	1.01	rpm	0	*Engine speed (spn 190 - SAE J1939)*
091	1.01	%	1	*Engine oil level (spn 98 - SAE J1939)*
092	1.01	%	1	*Engine coolant level (spn 111 - SAE J1939)*
093	1.01	%	1	*Engine fuel level*
094	1.01	l	1	*Engine fuel level (l)*
096	1.01	L/H	1	*Engine fuel rate (actual) (spn 183 - SAE J1939)*
097	1.01	L/H	1	*Engine fuel rate (average) (spn 1029 - SAE J1939)*
100	1.01	L	0	*Engine fuel used (total) (spn 250 - SAE J1939)*
101	1.01	L	0	*Engine fuel used (partial) (spn 182 - SAE J1939)*
104	1.01	Vdc	1	*Battery voltage (ECU) (spn 158 - SAE J1939)*
105	1.01	Vdc	1	*Battery voltage (controller)*
107	1.01	-	0	*MTU diagnostic code (ECU)*
108	1.01	-	0	*Engine number of starts (controller)*
111	1.01	H	0	*Engine total hours of operation (ECU) (spn 247 - SAE J1939)*
112	1.01	H	0	*Engine hours of operation (controller) (total)*
113	1.01	H	0	*Engine hours of operation (controller) (partial)*
114	1.01	H	0	*Engine hours of operation with GCB closed (controller) (partial)*
115	1.01	H	0	*Engine hours of operation with protections disabled (controller) (partial)*
116	1.01	H	0	*Engine hours to maintenance 1 (controller) (partial)*
117	1.01	H	0	*Controller hours of operation*
118	1.01	H	0	*Engine hours to maintenance 2 (controller) (partial)*
119	1.01	H	0	*Days to maintenance (controller)*
120	1.01	bar	1	*Barometric pressure (spn 108 - SAE J1939)*
121	1.01	bar	1	*Engine oil pressure (spn 100 - SAE J1939)*
122	1.01	bar	1	*Engine coolant pressure (spn 109 - SAE J1939)*
123	1.01	bar	1	*Engine fuel delivery pressure (spn 94 - SAE J1939)*
124	1.01	bar	1	*Engine injector timing rail pressure (spn 156 - SAE J1939)*
125	1.01	bar	1	*Engine injector metering rail pressure (spn 157 - SAE J1939)*
126	1.01	bar	1	*Engine intake manifold pressure (spn 102 or 3563 - SAE J1939)*
127	1.05	bar	1	*MAN-DATALOGGER: Engine oil pressure 2* *GERAFLEX: fuel level*
128	1.09	bar	1	*Engine Air Temperature (spn 106 - SAE J1939)*
134	1.01	°C	1	*Ambient air temperature (spn 171 - SAE J1939)*
135	1.01	°C	1	*Engine ECU temperature (spn 1136 - SAE J1939)*
136	1.01	°C	1	*Engine oil temperature (spn 175 - SAE J1939)*
137	1.01	°C	1	*Engine coolant temperature (spn 110 - SAE J1939)*

138	1.01	°C	1	*Engine fuel temperature (spn 174 - SAE J1939)*
139	1.01	°C	1	*Engine intake manifold temperature (spn 105 - SAE J1939)*
140	1.01	°C	1	*Engine turbocharger compressor outlet temperature (spn 2629 - SAE J1939)*
141	1.01	°C	1	*Engine exhaust gas temperature - Left manifold (spn 2434 - SAE J1939)*
142	1.01	°C	1	*Engine exhaust gas temperature - Right manifold (spn 2433 - SAE J1939)*
143	1.01	°C	1	*Engine intercooler temperature (spn 52 - SAE J1939)*
144	1.01	°C	1	*Engine alternator bearing 1 temperature (left or rear) (spn 1122 - SAE J1939)*
145	1.01	°C	1	*Engine alternator bearing 2 temperature (right or front) (spn 1123 - SAE J1939)*
146	1.01	°C	1	*Engine alternator winding 1 temperature (spn 1124 - SAE J1939)*
147	1.01	°C	1	*Engine alternator winding 2 temperature (spn 1125 - SAE J1939)*
148	1.01	°C	1	*Engine alternator winding 3 temperature (spn 1126 - SAE J1939)*
149	1.01	°C	1	*Auxiliary temperature 1 (spn 441 - SAE J1939)*
150	1.01	°C	1	*Auxiliary temperature 2 (spn 442 - SAE J1939)*
151	1.01	°C	1	*Engine oil temperature 2 (spn 1135 - SAE J1939)*
152	1.05	°C	1	*MAN-DATALOGGER: engine coolant temperature 2* *GERAFLEX: injection time*
153	1.05	%	1	*DPF soot load % (spn 3719 - SAE J1939)*
154	1.05	%	1	*DPF ash load % (spn 3720 - SAE J1939)*
155	1.05	s	0	*DPF time since last regeneration s (spn 3721 - SAE J1939)*
156	1.05	%	1	*SCR catalyst tank level % (spn 1761 - SAE J1939)*
157	1.05	°C	1	*SCR catalyst tank temperature (spn 3031 - SAE J1939)*
158	1.05	°C	1	*DPF outlet gas temperature (spn 3246 - SAE J1939)*
159	1.05	°C	1	*DPF exhaust gas temperature (spn 3241 - SAE J1939)*
160	1.05	°C	1	*DPF inlet gas temperature (spn 3242 - SAE J1939)*
209	1.08		1	Measure #01 (without sign) from engine management by file
210	1.08		1	Measure #02 (without sign) from engine management by file
211	1.08		1	Measure #03 (without sign) from engine management by file
212	1.08		1	Measure #04 (without sign) from engine management by file
213	1.08		1	Measure #05 (without sign) from engine management by file
214	1.08		1	Measure #06 (without sign) from engine management by file
215	1.08		1	Measure #07 (without sign) from engine management by file
216	1.08		1	Measure #08 (without sign) from engine management by file
217	1.08		1	Measure #01 (with sign) from engine management by file
218	1.08		1	Measure #02 (with sign) from engine management by file
219	1.08		1	Measure #03 (with sign) from engine management by file
220	1.08		1	Measure #04 (with sign) from engine management by file
221	1.08		1	Measure #05 (with sign) from engine management by file
222	1.08		1	Measure #06 (with sign) from engine management by file
223	1.08		1	Measure #07 (with sign) from engine management by file
224	1.08		1	Measure #08 (with sign) from engine management by file
225	1.16		0	spn 3697: (64892) Diesel Particulate Filter Lamp Command
226	1.16		0	spn 3701: (64892) Aftertreatment Diesel Particulate Filter Status
227	1.16		0	spn 3700: (64892) Aftertreatment Diesel Particulate Filter Active Regeneration Status
228	1.16		0	spn 3699: (64892) Aftertreatment Diesel Particulate Filter Passive Regeneration Status
229	1.16		0	DPF Manual Regeneration Status
230	1.16		0	spn 3703: (64892) Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch
231	1.16		0	spn 3698: (64892) Exhaust System High Temperature Lamp Command
232	1.16		0	spn 5245: (65110) Aftertreatment Diesel Exhaust Fluid Tank Low Level Indicator
233	1.16		0	spn 6915: (64586) SCR System Cleaning Lamp Command
234	1.16		0	spn 6918: (64586) SCR System Cleaning Inhibited Due to Inhibit Switch
257	1.05	Vdc	1	*Electronic batteries' average voltage*
258	1.05	Adc	1	*Electronic batteries' total current*

259	1.05	°C	1	*Electronic batteries' average temperature*
260	1.05	Ah	1	*Electronic batteries' total charge*
261	1.05	Vdc	1	*Lowest voltage of the electronic batteries*
262	1.05	Vdc	1	*Highest voltage of the electronic batteries*
263	1.05	#C	1	*Lowest temperature of the electronic batteries*
264	1.05	#C	1	*Highest temperature of the electronic batteries*
273	1.05	Vdc	1	*Electronic battery #01: voltage*
274	1.05	Adc	1	*Electronic battery #01: current*
275	1.05	°C	1	*Electronic battery #01: temperature*
276	1.05	Ah	1	*Electronic battery #01: charge*
281	1.05	-	1	*Electronic battery #01: alarm #1*
282	1.05	-	1	*Electronic battery #01: alarm #2*
283	1.05	-	1	*Electronic battery #01: alarm #3*
284	1.05	-	1	*Electronic battery #01: alarm #4*
305	1.05	Vdc	1	*Electronic battery #02: voltage*
306	1.05	Adc	1	*Electronic battery #02: current*
307	1.05	°C	1	*Electronic battery #02: temperature*
308	1.05	Ah	1	*Electronic battery #02: charge*
313	1.05	-	1	*Electronic battery #02: alarm #1*
314	1.05	-	1	*Electronic battery #02: alarm #2*
315	1.05	-	1	*Electronic battery #02: alarm #3*
316	1.05	-	1	*Electronic battery #02: alarm #4*
337	1.05	Vdc	1	*Electronic battery #03: voltage*
338	1.05	Adc	1	*Electronic battery #03: current*
339	1.05	°C	1	*Electronic battery #03: temperature*
340	1.05	Ah	1	*Electronic battery #03: charge*
345	1.05	-	1	*Electronic battery #03: alarm #1*
346	1.05	-	1	*Electronic battery #03: alarm #2*
347	1.05	-	1	*Electronic battery #03: alarm #3*
348	1.05	-	1	*Electronic battery #03: alarm #4*
369	1.05	Vdc	1	*Electronic battery #04: voltage*
370	1.05	Adc	1	*Electronic battery #04: current*
371	1.05	°C	1	*Electronic battery #04: temperature*
372	1.05	Ah	1	*Electronic battery #04: charge*
377	1.05	-	1	*Electronic battery #04: alarm #1*
378	1.05	-	1	*Electronic battery #04: alarm #2*
379	1.05	-	1	*Electronic battery #04: alarm #3*
380	1.05	-	1	*Electronic battery #04: alarm #4*
401	1.05	Vdc	1	*Electronic battery #05: voltage*
402	1.05	Adc	1	*Electronic battery #05: current*
403	1.05	°C	1	*Electronic battery #05: temperature*
404	1.05	Ah	1	*Electronic battery #05: charge*
409	1.05	-	1	*Electronic battery #05: alarm #1*
410	1.05	-	1	*Electronic battery #05: alarm #2*
411	1.05	-	1	*Electronic battery #05: alarm #3*
412	1.05	-	1	*Electronic battery #05: alarm #4*
433	1.05	Vdc	1	*Electronic battery #06: voltage*
434	1.05	Adc	1	*Electronic battery #06: current*
435	1.05	°C	1	*Electronic battery #06: temperature*
436	1.05	Ah	1	*Electronic battery #06: charge*
441	1.05	-	1	*Electronic battery #06: alarm #1*
442	1.05	-	1	*Electronic battery #06: alarm #2*
443	1.05	-	1	*Electronic battery #06: alarm #3*
444	1.05	-	1	*Electronic battery #06: alarm #4*
465	1.05	Vdc	1	*Electronic battery #07: voltage*
466	1.05	Adc	1	*Electronic battery #07: current*
467	1.05	°C	1	*Electronic battery #07: temperature*
468	1.05	Ah	1	*Electronic battery #07: charge*
473	1.05	-	1	*Electronic battery #07: alarm #1*

474	1.05	-	1	*Electronic battery #07: alarm #2*
475	1.05	-	1	*Electronic battery #07: alarm #3*
476	1.05	-	1	*Electronic battery #07: alarm #4*
497	1.05	Vdc	1	*Electronic battery #08: voltage*
498	1.05	Adc	1	*Electronic battery #08: current*
499	1.05	°C	1	*Electronic battery #08: temperature*
500	1.05	Ah	1	*Electronic battery #08: charge*
505	1.05	-	1	*Electronic battery #08: alarm #1*
506	1.05	-	1	*Electronic battery #08: alarm #2*
507	1.05	-	1	*Electronic battery #08: alarm #3*
508	1.05	-	1	*Electronic battery #08: alarm #4*
529	1.05	Vdc	1	*Electronic battery #09: voltage*
530	1.05	Adc	1	*Electronic battery #09: current*
531	1.05	°C	1	*Electronic battery #09: temperature*
532	1.05	Ah	1	*Electronic battery #09: charge*
537	1.05	-	1	*Electronic battery #09: alarm #1*
538	1.05	-	1	*Electronic battery #09: alarm #2*
539	1.05	-	1	*Electronic battery #09: alarm #3*
540	1.05	-	1	*Electronic battery #09: alarm #4*
561	1.05	Vdc	1	*Electronic battery #10: voltage*
562	1.05	Adc	1	*Electronic battery #10: current*
563	1.05	°C	1	*Electronic battery #10: temperature*
564	1.05	Ah	1	*Electronic battery #10: charge*
569	1.05	-	1	*Electronic battery #10: alarm #1*
570	1.05	-	1	*Electronic battery #10: alarm #2*
571	1.05	-	1	*Electronic battery #10: alarm #3*
572	1.05	-	1	*Electronic battery #10: alarm #4*
593	1.05	Vdc	1	*Electronic battery #11: voltage*
594	1.05	Adc	1	*Electronic battery #11: current*
595	1.05	°C	1	*Electronic battery #11: temperature*
596	1.05	Ah	1	*Electronic battery #11: charge*
601	1.05	-	1	*Electronic battery #11: alarm #1*
602	1.05	-	1	*Electronic battery #11: alarm #2*
603	1.05	-	1	*Electronic battery #11: alarm #3*
604	1.05	-	1	*Electronic battery #11: alarm #4*
625	1.05	Vdc	1	*Electronic battery #12: voltage*
626	1.05	Adc	1	*Electronic battery #12: current*
627	1.05	°C	1	*Electronic battery #12: temperature*
628	1.05	Ah	1	*Electronic battery #12: charge*
633	1.05	-	1	*Electronic battery #12: alarm #1*
634	1.05	-	1	*Electronic battery #12: alarm #2*
635	1.05	-	1	*Electronic battery #12: alarm #3*
636	1.05	-	1	*Electronic battery #12: alarm #4*
657	1.05	Vdc	1	*Electronic battery #13: voltage*
658	1.05	Adc	1	*Electronic battery #13: current*
659	1.05	°C	1	*Electronic battery #13: temperature*
660	1.05	Ah	1	*Electronic battery #13: charge*
665	1.05	-	1	*Electronic battery #13: alarm #1*
666	1.05	-	1	*Electronic battery #13: alarm #2*
667	1.05	-	1	*Electronic battery #13: alarm #3*
668	1.05	-	1	*Electronic battery #13: alarm #4*
689	1.05	Vdc	1	*Electronic battery #14: voltage*
690	1.05	Adc	1	*Electronic battery #14: current*
691	1.05	°C	1	*Electronic battery #14: temperature*
692	1.05	Ah	1	*Electronic battery #14: charge*
697	1.05	-	1	*Electronic battery #14: alarm #1*
698	1.05	-	1	*Electronic battery #14: alarm #2*
699	1.05	-	1	*Electronic battery #14: alarm #3*
700	1.05	-	1	*Electronic battery #14: alarm #4*

721	1.05	Vdc	1	*Electronic battery #15: voltage*
722	1.05	Adc	1	*Electronic battery #15: current*
723	1.05	°C	1	*Electronic battery #15: temperature*
724	1.05	Ah	1	*Electronic battery #15: charge*
729	1.05	-	1	*Electronic battery #15: alarm #1*
730	1.05	-	1	*Electronic battery #15: alarm #2*
731	1.05	-	1	*Electronic battery #15: alarm #3*
732	1.05	-	1	*Electronic battery #15: alarm #4*
753	1.05	Vdc	1	*Electronic battery #16: voltage*
754	1.05	Adc	1	*Electronic battery #16: current*
755	1.05	°C	1	*Electronic battery #16: temperature*
756	1.05	Ah	1	*Electronic battery #16: charge*
761	1.05	-	1	*Electronic battery #16: alarm #1*
762	1.05	-	1	*Electronic battery #16: alarm #2*
763	1.05	-	1	*Electronic battery #16: alarm #3*
764	1.05	-	1	*Electronic battery #16: alarm #4*

3.2.4.5 RN200 (rev. 01.08)

Index	Rev.	U.M.	Format	Description
001	1.00	Hz	1	Busbars frequency
002	1.00	Vac	1	Busbars voltage L1-N
003	1.00	Vac	1	Busbars voltage L2-N
004	1.00	Vac	1	Busbars voltage L3-N
005	1.00	Vac	1	Busbars voltage N-Battery
006	1.00	Vac	1	Busbars voltage L1-L2
007	1.00	Vac	1	Busbars voltage L2-L3
008	1.00	Vac	1	Busbars voltage L3-L1
009	1.00	Vac	1	Busbars voltage L-L average
012	1.00	Hz	1	Renewable sources frequency
013	1.00	Vac	1	Renewable sources voltage L1-N
014	1.00	Vac	1	Renewable sources voltage L2-N
015	1.00	Vac	1	Renewable sources voltage L3-N
016	1.00	Vac	1	Renewable sources voltage N-Battery
017	1.00	Vac	1	Renewable sources voltage L1-L2
018	1.00	Vac	1	Renewable sources voltage L2-L3
019	1.00	Vac	1	Renewable sources voltage L3-L1
020	1.00	Vac	1	Renewable sources voltage L-L average
023	1.00	Aac	1	Current L1
024	1.00	Aac	1	Current L2
025	1.00	Aac	1	Current L3
026	1.00	Aac	1	Auxiliary current (or neutral current)
031	1.00	kW	1	Active power L1
032	1.00	kW	1	Active power L2
033	1.00	kW	1	Active power L3
034	1.00	kW	1	Total active power
038	1.00	kVA	1	Apparent power L1
039	1.00	kVA	1	Apparent power L2
040	1.00	kVA	1	Apparent power L3
041	1.00	kVA	1	Total apparent power
044	1.00	kvar	1	Reactive power L1
045	1.00	kvar	1	Reactive power L2
046	1.00	kvar	1	Reactive power L3
047	1.00	kvar	1	Total reactive power
055	1.00	-	1	Power factor L1 (calculated from kW and kVA)
056	1.00	-	1	Power factor L2 (calculated from kW and kVA)
057	1.00	-	1	Power factor L3 (calculated from kW and kVA)
058	1.00	-	1	Total power factor (calculated from kW and kVA)
059	1.00	-	1	Total Cos(phi) (calculated from kW and kvar)

Index	Rev.	U.M.	Format	Description
074	1.00	kW	1	Active power on the renewable sources
075	1.00	kW	1	Active power on the loads
076	1.00	kW	1	Active power on the generators
077	1.00	kW	1	Active power on the MGCB
098	1.00	kWh	0	Renewable sources active energy (total)
099	1.00	kWh	0	Renewable sources active energy (partial)
100	1.00	kvarh	0	Renewable sources reactive energy (total)
101	1.00	kvarh	0	Renewable sources reactive energy (partial)
105	1.00	Vdc	1	Power supply voltage
117	1.00	H	0	Controller's hours of operation

3.2.4.6 BTB200 (rev. 01.10)

Index	Rev.	U.M.	Format	Description
001	1.10	Hz	1	BUS A frequency
002	1.10	Vac	1	BUS A voltage L1-N
003	1.10	Vac	1	BUS A voltage L2-N
004	1.10	Vac	1	BUS A voltage L3-N
005	1.10	Vac	1	BUS A voltage N-Battery
006	1.10	Vac	1	BUS A voltage L1-L2
007	1.10	Vac	1	BUS A voltage L2-L3
008	1.10	Vac	1	BUS A voltage L3-L1
009	1.10	Vac	1	BUS A voltage L-L average
012	1.10	Hz	1	BUS B frequency
013	1.10	Vac	1	BUS B voltage L1-N
014	1.10	Vac	1	BUS B voltage L2-N
015	1.10	Vac	1	BUS B voltage L3-N
016	1.10	Vac	1	BUS B voltage N-Battery
017	1.10	Vac	1	BUS B voltage L1-L2
018	1.10	Vac	1	BUS B voltage L2-L3
019	1.10	Vac	1	BUS B voltage L3-L1
020	1.10	Vac	1	BUS B voltage L-L average
023	1.10	Aac	1	Current L1
024	1.10	Aac	1	Current L2
025	1.10	Aac	1	Current L3
026	1.10	Aac	1	Auxiliary current (or neutral current)
031	1.10	kW	1	Active power L1
032	1.10	kW	1	Active power L2
033	1.10	kW	1	Active power L3
034	1.10	kW	1	Total active power
038	1.10	kVA	1	Apparent power L1
039	1.10	kVA	1	Apparent power L2
040	1.10	kVA	1	Apparent power L3
041	1.10	kVA	1	Total apparent power
044	1.10	kvar	1	Reactive power L1
045	1.10	kvar	1	Reactive power L2
046	1.10	kvar	1	Reactive power L3
047	1.10	kvar	1	Total reactive power
055	1.10	-	1	Power factor L1 (calculated from kW and kVA)
056	1.10	-	1	Power factor L2 (calculated from kW and kVA)
057	1.10	-	1	Power factor L3 (calculated from kW and kVA)
058	1.10	-	1	Total power factor (calculated from kW and kVA)
059	1.10	-	1	Total Cos(phi) (calculated from kW and kvar)
063	1.10	kWh	0	Active energy total A->B
065	1.10	kvarh	0	Active energy partial A->B
069	1.10	kWh	0	Reactive energy total A->B
071	1.10	kvarh	0	Reactive energy partial A->B
082	1.10	%	1	Active energy total B->A

Index	Rev.	U.M.	Format	Description
086	1.10	%	1	Active energy partial B->A
105	1.10	Vdc	1	Reactive energy total B->A
117	1.10	H	0	Reactive energy partial B->A

3.2.5 SP – Set points

The SP resources numerical values are programmable by the user, apart from the PLC logic (directly on the controller, using the keyboard or through the communication ports). The unit of measurement, the format, the description, the default value and the programming thresholds are defined for each set point inside the PLC program. They can be used only as input resources for the PLC blocks. They can never be used as output resources.

They are identified by the sign “SP_XXX”, where “XXX” indicates the number (starting from 1) of the set point resource.

3.2.6 KK – Numerical constants

The resources KK are constant numerical values defined by the user in the PLC logic. They can be used only as input resources for the PLC blocks. They can never be used as output resources.

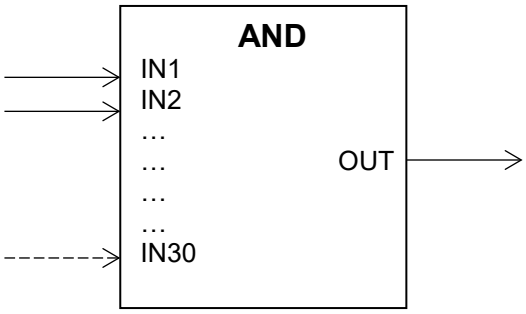
The user introduces the numerical value directly in the PLC block (including possible decimal values separated by “,”). The compiler will automatically create a sorted list of the constants with the related format and decimal point.

They are identified by the sign “KK_XXX”, where “XXX” indicates the number (starting from 1) of the constant.

4. PLC Blocks

4.1 AND

Symbol:



Syntax:

```
<AND number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
        <in></in>
        …
        <in></in>
</AND>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	D	DI(V), DI(S), DO, DT	0 / 1	AND Logic result

Input	Type	Resources available	Format	Description
IN …	D	DI, DO, DT, AL, ST	0 / 1	Input …

Description:

The block introduces the AND logic among all input digital resources (<in>) and records the result in another digital resource (<out>).

The block can only include an output (<out>) and from 2 up to 30 inputs (<in>). The name of the digital resource must be written in the fields <in> and <out>.

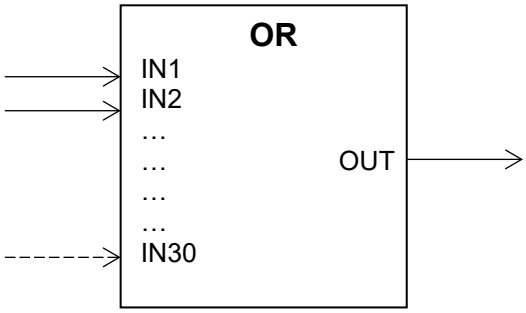
Example:

```
<AND number="1" xpos="0" ypos="0" description="">
        <out>-DO_DITEL_02_03</out>
        <in>DI_CONTROLLER_01</in>
        <in>DI_CONTROLLER_02</in>
        <in>DI_CONTROLLER_03</in>
</AND>
```

The previous block includes an AND logic among the first three controller digital inputs and it inverts the result before recording it in the third output of the second module DITEL.

4.2 OR

Symbol:



Syntax:

```
<OR number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
        <in></in>
        …
        <in></in>
</OR>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	D	DI(V), DI(S), DO, DT	0 / 1	OR Logic result

Input	Type	Resources available	Format	Description
IN …	D	DI, DO, DT, AL, ST	0 / 1	Input …

Description:

The block introduces the OR logic among all input digital resources (<in>) and records the result in another digital resource (<out>).

The block can only include an output (<out>) and from 2 up to 30 inputs (<in>). The name of the digital resource must be written in the fields <in> and <out>.

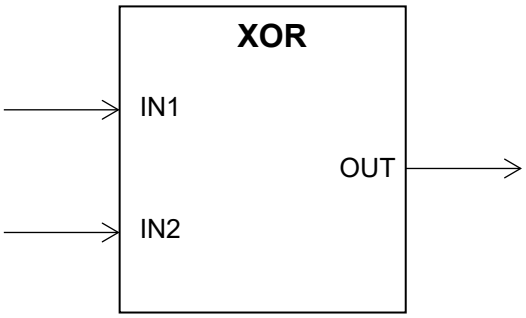
Example:

```
<OR number="1" xpos="0" ypos="0" description="">
        <out>-DO_DITEL_02_03</out>
        <in>DI_CONTROLLER_01</in>
        <in>DI_CONTROLLER_02</in>
        <in>DI_CONTROLLER_03</in>
</OR>
```

The previous block includes an OR logic among the first three controller digital inputs and it inverts the result before recording it in the third output of the second module DITEL.

4.3 XOR

Symbol:



Syntax:

```
<XOR number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
        <in></in>
</XOR>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	D	DI(V), DI(S), DO, DT	0 / 1	XOR Logic result

Input	Type	Resources available	Format	Description
IN …	D	DI, DO, DT, AL, ST	0 / 1	Input …

Description:

The block introduces the XOR logic between the two input digital resources (<in>) and records the result in another digital resource (<out>).

The block can only include one output (<out>) and two inputs (<in>). The name of the digital resource must be written in the fields <in> and <out>.

Example:

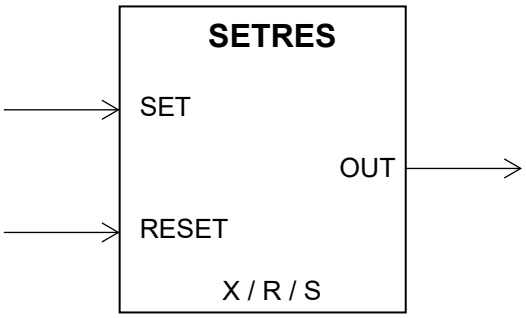
```
<XOR number="1" xpos="0" ypos="0" description="">
```

```
        <out>DO_CONTROLLER_05</out>
        <in>-DI_CONTROLLER_01</in>
        <in>DI_CONTROLLER_02</in>
</XOR>
```

The previous block includes an XOR logic between the inverse of the first input and the second digital input of the controller and it records the result of the fifth output of the controller.

4.4 SET / RESET

Symbol:



Syntax:

```
<SETRES number="1" xpos="0" ypos="0" description="">
        <out></out>
        <set></set>
        <res></res>
        <type></type>
</SETRES>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	D	DI(V), DI(S), DO, DT	0 / 1	SR Digital output

Input	Type	Resources available	Format	Description
SET	D	DI, DO, DT, AL, ST	0 / 1	SET Input
RESET	D	DI, DO, DT, AL, ST	0 / 1	RESET Input
TYPE	N	-	X / R / S	Priority when both inputs are active

Description:

The block uses the flip-flop SR logic. It uses a digital input SET <set> and a digital input RESET <res> and it records the result in the digital resource (<out>), according to the following logic:

- If the input S is active (logic status 1), the output <out> is activated.
- If the input R is active (logic status 1), the output <out> is deactivated.
- if both inputs S and R are deactivated (logic status 0), the output <out> stays unvaried.
- if both inputs S and R are activated (logic status 1), the output <out> is commanded according to the priority parameter:

- X: the output <out> stays unvaried.
- R: the output <out> is deactivated.
- S: the output <out> is activated.

The block can only contain one output (<out>), one set input (<set>) and one reset input (<res>).

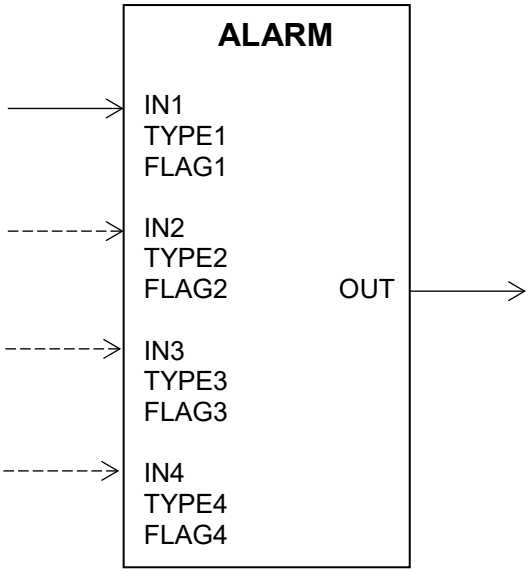
Example:

```
<SETRES number="1" xpos="0" ypos="0" description="">
        <out>DO_CONTROLLER_01</out>
        <set>DI_CONTROLLER_01</set>
        <res>DI_CONTROLLER_03</res>
        <type>X</type>
</SETRES>
```

DI_CONTROLLER_01	DI_CONTROLLER_03	DO_CONTROLLER_01
0	1	0
1	0	1
0	0	Unvaried
1	1	X: Unvaried R: 0 S: 1

4.5 ALARM

Symbol:



Syntax:

```
<ALARM number="1" xpos="0" ypos="0" description="">
        <out></out>
        <err>
                <in></in>
                <type></type>
                <flags></flags>
```

```
        </err>
        …
        <err>
                <in></in>
                <type></type>
                <flags></flags>
        </err>
</ALARM>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	D	AL	0 / 1	Alarm output

Input	Type	Resources available	Format	Description
IN	D	DI, DO, DT, AL, ST	0 / 1	
TYPE	N	-	W U D A	Alarm type
FLAG	N	-	0 / 32768	Alarm activation options

Description:

The ALARM block is used to activate a fault on the controller, among the ones reserved to the PLC (see “3.1.4 AL - Alarms” for further details). The fault is not activated when the controller is in OFF-RESET mode.

The block only contains one output <out>, which can be activated according to some conditions (from 1 up to 4). The possible conditions that describe the fault are included into <err> nodes and for each of them you need to clarify:

- <in>: input digital resource. The anomaly is activated if this resource is “1”.
- <type>: category of the anomaly that will be activated according to the status of the previous digital resource. Types available:
    - **W: warning**. It is used to indicate a fault that requires a manual operation but without turning off the engine.
    - **WK: latched warning (HS315 only)**. It is used to indicate a fault that requires a manual operation but without turning off the engine. A real RESET is required.
    - **U: unload (only GC600 and DST4602)**. It is used to indicate a fault that requires the deactivation of the genset. That is carried out by decreasing the power supplied gradually, with rapid unload pad, before the real deactivation. It is valid for parallel applications only.
    - **D: deactivation.** It is used to indicate a fault that make the genset operation impossible and causes the automatic and immediate switch off of the engine with standard procedure (with cooling period).
    - **A: alarm**. It is used to indicate a fault that prevents the generator from operating and causes automatic and immediate emergency engine shut-down.
- <flags>: it allows the user to select one or more options related to the activation of the anomaly. The <flag> field must be filled in with a number, which is obtained by the sum of the values contained in the column “Code” of the following table, referred to one or more activation conditions required:

DST4602, GC600, HS315.

Code	Description

1	Enabled when the engine is running (not during stop cycle).
2	Enabled after P.0216 seconds from the start of the engine.
4	Enabled when the GCB is closed.
8	Enabled when the FUEL solenoid is activated.
16	Enabled when the GAS solenoid is activated.
32	Enabled when the controller is in AUTO, TEST or REMOTE START mode.
64	Enabled after the generator frequency/voltages are the first time in threshold from start.
128	Enabled when the engine is running (even during stop cycle).
4096	The alarm is set as 'warning' if 'generator protections override' is active.
8192	The alarm is set as 'warning' if 'full protections override' is active.
16384	Set even if a more serious alarm is still set.
32768	The alarm is set as 'warning' if 'engine protections override' is active.

MC200.

Code	Description
32	Enabled when the controller is in AUTO, TEST or REMOTE START mode.
8192	The alarm is set as 'warning' if 'full protections override' is active.
16384	Set even if a more serious alarm is still set.
32768	The alarm is set as 'warning' if 'engine protections override' is active.

The fault is activated only if at least one of the inputs is active. If more conditions, related to the same fault, happen together, the fault is activated with the higher category (<type>).

The deactivation of the fault is carried out if all inputs are deactivated.

Example:

```
<ALARM number="1" xpos="0" ypos="0" description="New alarm">
        <out>AL_901</out>
        <err>
                <in>DI_CONTROLLER_01</in>
                <type>W</type>
                <flags>0</flags>
        </err>
        <err>
                <in>DI_CONTROLLER_01</in>
                <type>A</type>
                <flags>4</flags>
        </err>
</ALARM>
```

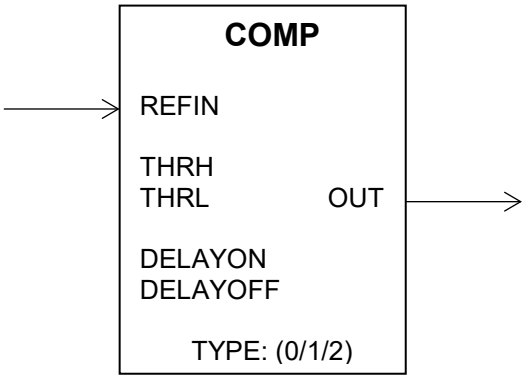
In the previous example, the fault AL_901 is created if the first digital input of the controller is active (logic status “1”). So:

- usually as “Warning”
- or as “Alarm” when GCB is closed.

Anyway, it is possible to use different digital inputs (in the field <in>) for each <err> node.

4.6 COMPARATOR

Symbol:



Syntax:

```
<COMP number="1" xpos="0" ypos="0" description="">
        <type></type>
        <out></out>
        <refin></refin>
        <thrh></thrh>
        <thrl></thrl>
        <delayon></delayon>
        <delayoff></delayoff>
</COMP>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	D	DI(V), DI(S), DO, DT	0 / 1	Comparator output

Input	Type	Resources available	Format	Description
REFIN	N	AI, AO, AM, AT	any	Value to compare
THRH	N	AI, AO, AM, AT, SP, KK	as REFIN	Upper threshold
THRL	N	AI, AO, AM, AT, SP, KK	as REFIN	Lower threshold
DELAYON	N	AI, AO, AM, AT, SP, KK	seconds	Output activation delay
DELAYOFF	N	AI, AO, AM, AT, SP, KK	seconds	Output deactivation delay

Description:

The <out> parameter defines the digital output resource that stores the result of the comparison. You can use the minus sign ("-") before the resource to invert the output value.

The parameter <refin> defines the analogue resource to compare.

The parameter <thrh> and <thrl> define the maximum and minimum thresholds of the comparator. If the thresholds values are set in inverted order, the PLC internally inverts them to use always the threshold

with the biggest value as maximum threshold. The threshold <thrl> is not used for the comparator without hysteresis (type 0).

The parameter <delayon> is a delay expressed in seconds, which can be set with decimal values too. The digital output <out> is activated when the result of the comparison is true for the time set. If the time is set to “0”, the output is activated with no delay.

The parameter <delayoff> is a delay expressed in seconds, which can be set with decimal values too. The digital output <out> is deactivated when the result of the comparison is false for the time set. If the time is set to “0”, the output is deactivated with no delay.

The parameter <type> defines the type of comparator:

0 = comparator without hysteresis;

1 = comparator with hysteresis;

2 = window comparator.

Example:

```
<COMP number="1" xpos="0" ypos="0" description="Temp limits">
    <type>2</type>
    <out>DO_CONTROLLER_01</out>
    <refin>AI_CONTROLLER_01</refin>
    <thrh>120</thrh>
    <thrl>80</thrl>
    <delayon>3.2</delayon>
    <delayoff>7</delayoff>
</COMP>
```

The previous block uses the comparison between the analogue input 1 of the controller (e.g. temperature) and the two thresholds (120°C and 80°C). The comparator is a window one (type = 2) and the digital output 1 of the controller is:

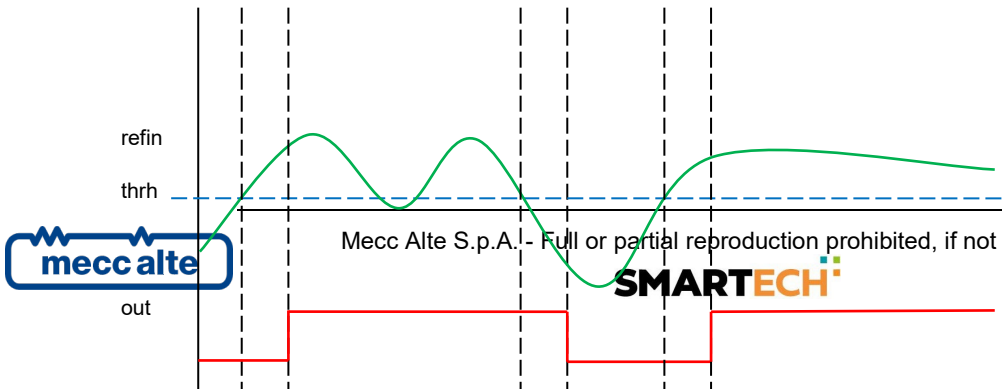
- Activated, when the temperature is between 80°C and 120°C for 3,2 sec;
- Deactivated, when the temperature is higher than 120°C for 7 seconds;
- Deactivated, when the temperature is lower than 80°C for 7 seconds;

4.6.1 COMPARATOR WITHOUT HYSTERESIS

The comparator without hysteresis does not use the parameter <thrl>. It activates the output if the input value <refin> is strictly higher than the threshold <thrl> for the time <delayon> configured; vice versa, it deactivates the output if the value <refin> is strictly lower than the threshold <thrl> for the time <delayoff> configured.

Attention: the output remains unchanged if the input value <refin> is equal to the threshold <thrh>.

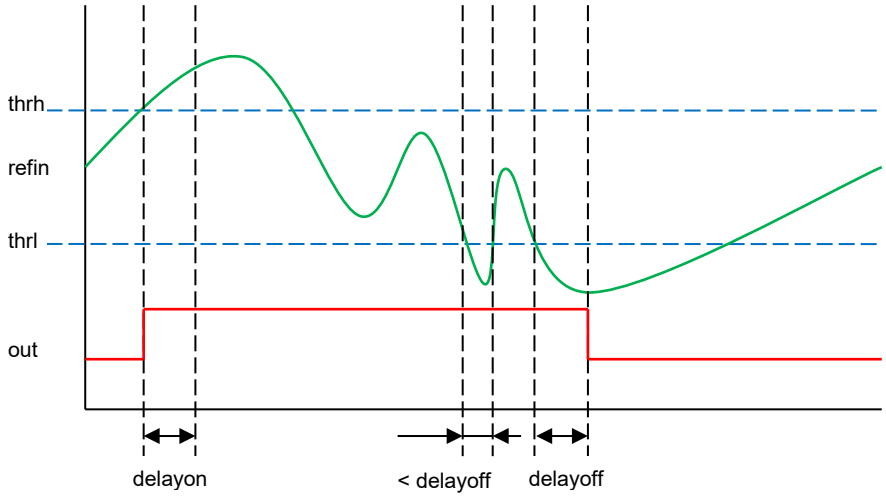
- Type 0 (set 0 in the parameter <type>).



4.6.2 COMPARATOR WITH HYSTERESIS

The comparator with hysteresis activates the output if the input value <refin> is strictly higher than the threshold <thrl> for the time <delayon> configured; vice versa, it deactivates the output if the value <refin> is strictly lower than the threshold <thrl> for the time <delayoff> configured.

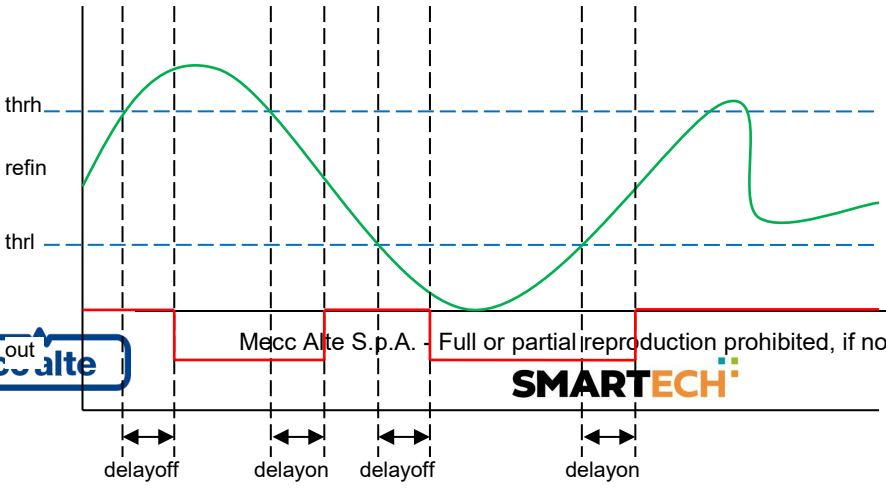
- Type 1 (set 1 in the parameter <type>).



4.6.3 WINDOW COMPARATOR

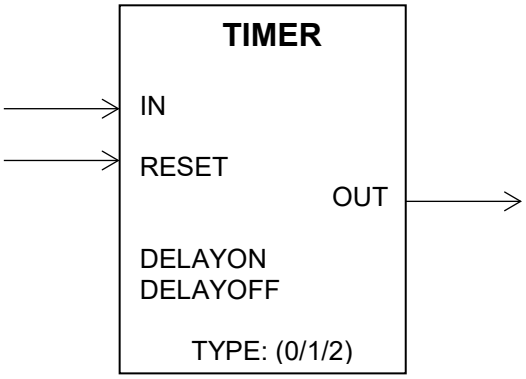
The window comparator activates the output if the input value <refin> is strictly higher than the threshold <thrl> and strictly lower than the threshold <thrh> for the time <delayon> configured; vice versa, it deactivates the output if the value <refin> is lower or equal than the threshold <thrl> or higher or equal than the maximum threshold <thrl> for the time <delayoff> configured.

- Type 2 (set 2 in the parameter <type>).



4.7 TIMER

Symbol:



Syntax:

```
<TIMER number="1" xpos="0" ypos="0" description="">
        <type></type>
        <out></out>
        <in></in>
        <reset></reset>
        <delayon></delayon>
        <delayoff></delayoff>
</TIMER>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	D	DI(V), DI(S), DO, DT	0 / 1	Time Digital output

Input	Type	Resources available	Format	Description
IN	D	DI, DO, DT, AL, ST	0 / 1	
RESET	D	DI, DO, DT, AL, ST	0 / 1	
DELAYON	N	AI, AO, AM, AT, SP, KK	seconds	Output activation delay
DELAYOFF	N	AI, AO, AM, AT, SP, KK	seconds	Output deactivation delay

Description:

The parameter <out> defines the digital resource used as timed output.

The parameter <in> defines the reference digital resource to time.

The parameter <reset> is optional and if it is active it maintains the output deactivated.

The parameters <out>, <in> and <reset> can work also with inverted polarity, by adding the sign “-” before the identifier.

The parameters <delayon> and <delayoff> define, according to the type of timer, the time the output must follow with the input status. They are expressed in seconds and configurable also with decimal values. If the time is set to “0”, no delay is applied to the output.

The parameter <type> defines the type of timer:

- 0 = delay;
- 1 = impulse;
- 2 = pwm.

Example:

```
<TIMER number="1" xpos="0" ypos="0" description="Temp limits">
        <type>0</type>
        <out>DO_CONTROLLER_01</out>
        <in>DI_CONTROLLER_01</in>
        <reset></reset>
        <delayon>3.5</delayon>
        <delayoff>0</delayoff>
</TIMER>
```

The previous block uses the delay timer, where the first digital output of the controller is:

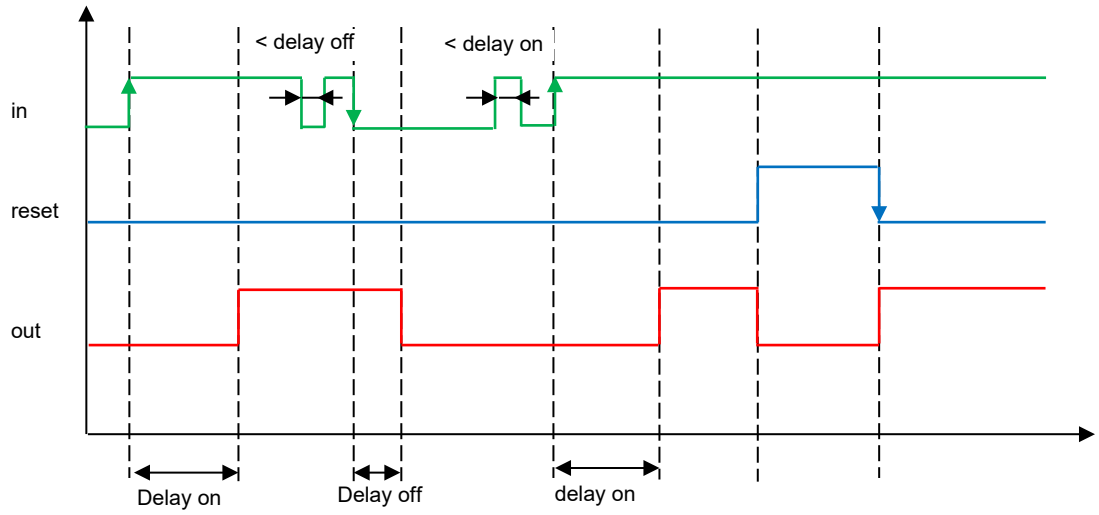
- Activated after 3,5 seconds from the rising edge of the digital input 1 of the controller;
- Deactivated at the same time of the falling edge of the digital input 1 of the controller.

The reset signal is not used.

4.7.1 DELAY TIMER

In the delay timer, the output <out> follows the statuses changes of the input <in> with the times set. If one or both times are set to zero, the output immediately follows the status changes of the input.

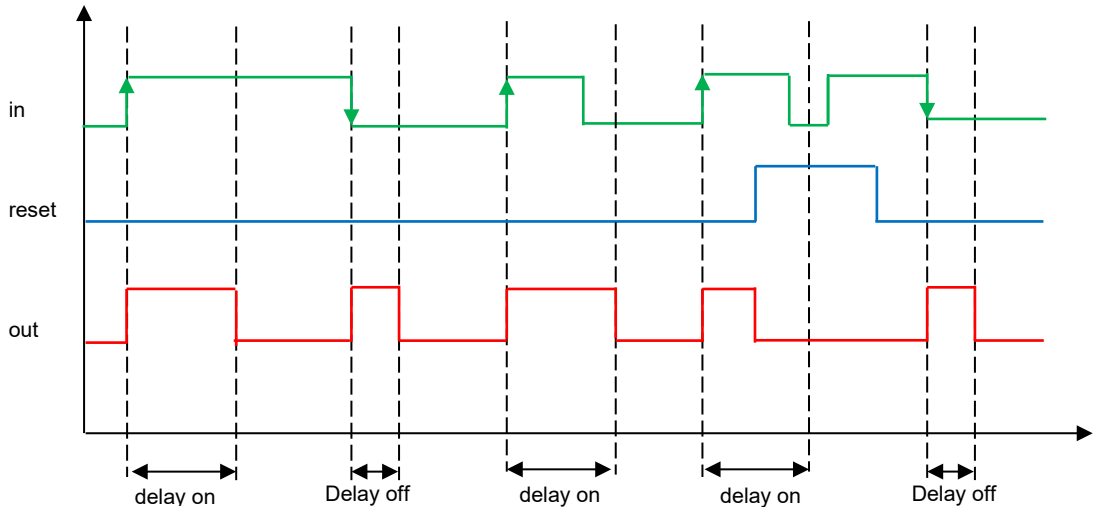
- Type 0 (set 0 in the parameter <type>).



4.7.2 IMPULSE TIMER

The impulse timer creates an impulse (equal to the time set) on the output <out>, in line with the status changes of the input <in>. If one or both times are set to zero, the output immediately follows the status changes of the input.

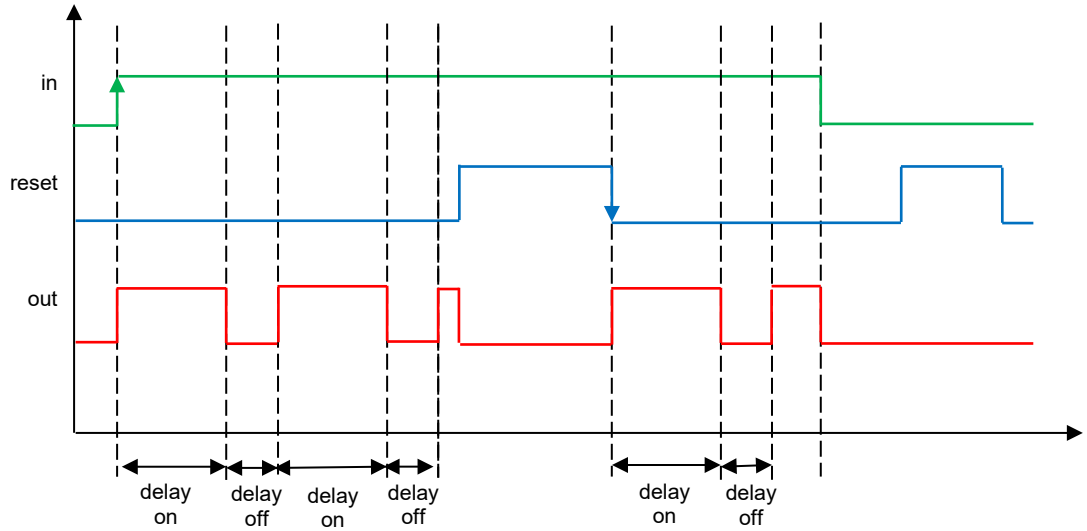
- Type 1 (set 1 in the parameter <type>).



4.7.3 PWM TIMER

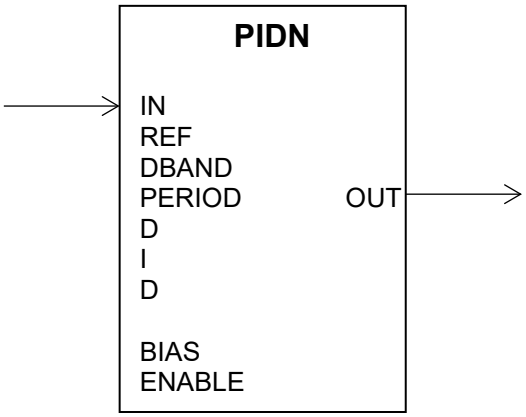
In the PWM timer, when the input <in> is active, the output <out> changes according to the times configured. The times <delayon> and <delayoff> can never be set to zero.

- Type 2 (set 2 in the parameter <type>).



4.8 PIDN (PID with analogue control)

Symbol:



Syntax:

```
<PIDN number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
        <ref></ref>
        <dband></dband>
        <period></period>
        <P></P>
        <I></I>
        <D></D>
        <bias></bias>
        <enable></enable>
</PIDN>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	0…100%	Actuator analogue command

Input	Type	Resources available	Format	Description
IN	N	AI, AO, AM, AT	any	Value to adjust
REF	N	AI, AO, AM, AT, SP, KK	come IN	Reference value
DBAND	N	AI, AO, AM, AT, SP, KK	come IN	Dead band
PERIOD	N	AI, AO, AM, AT, SP, KK	seconds	Regulation period
D	N	AI, AO, AM, AT, SP, KK	0…100%	Proportional
I	N	AI, AO, AM, AT, SP, KK	0…100%	Differential
D	N	AI, AO, AM, AT, SP, KK	0…100%	Derivative
BIAS	N	AI, AO, AM, AT, SP, KK	0…100%	Output value if PID is disabled
ENABLE	D	DI, DO, DT, AL, ST	0 / 1	Enable numerical PID

Description:

The parameter <out> defines the analogue output resource of the PID block to be used as an adjustment command for the actuator.

The parameter <in> defines the analogue measure to regulate.

The parameter <ref> defines the set point value to which the analogue measure should tend. The PIDN adjusts the output value <out> to have <in> equal to <ref>.

The parameter <dband> defines the minimum error (between value to adjust and set point), below which no correction is made on the output (dead band). If you desire the maximum accuracy, you need to have the dead band disabled by setting this parameter to “0”.
For example, if in the temperature regulation you would like to accept an error of +/- 1°C, this parameter must be set to 1.0. Therefore, if the difference between <in> and <ref> is lower than the dead band, the output stays unvaried. This allows to preserve the actuator from continuous unnecessary commands.

The parameter <period> defines the period of input sampling and output regulation.

The parameter <P> defines the proportional part of the PID regulator.

The parameter <I> defines the integrative part of the PID regulator.

The parameter <I> defines the derivative part of the PID regulator.

The parameter <bias> defines the value to set in the output when the PID regulator is disabled (from <enable> input).

The parameter <enable> defines the digital resource that enables the PID regulator. If no resource is assigned, the PID regulator stays enabled.

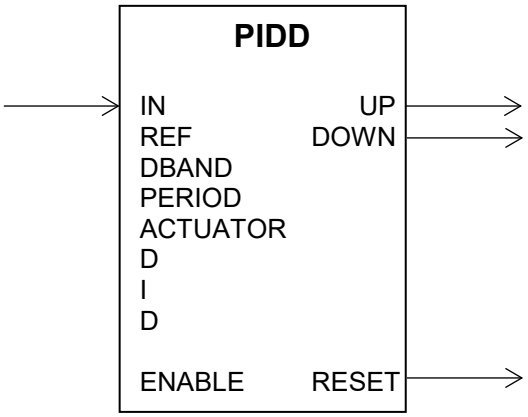
Example:

```
<PIDN number="1" xpos="0" ypos="0" description="Temperature control">
        <out>AO_CONTROLLER_01</out>
        <in>AI_DITEMP_01_01</in>
        <ref>75.0</ref>
        <dband>0</dband>
        <period>1.0</period>
        <P>SP_001</P>
        <I>0.1</I>
        <D>0</D>
        <bias>50.0</bias>
        <enable>DI_CONTROLLER_01</enable>
</PIDN>
```

In the previous example, the PID regulator is used to regulate the temperature acquired by the input 1 of the first DIGRIN to a 75°C set point. The output command towards the actuator is managed by the first analogue output of the controller. The “dead band” is disabled to have the maximum accuracy. The sampling period is set to one second and the proportional <P> (adjustable on the controller through a set point) and integrative <I> parts are used, while the regulator derivative <D> one is not used. The regulator can be disabled by activating the first input of the controller and, when disabled, the output is forced to 50% (value set in the parameter <bias>).

4.9 PIDD (PID with digital control up and down)

Symbol:



Syntax:

```
<PIDD number="1" xpos="0" ypos="0" description="">
        <up></up>
        <down></down>
        <reset></reset>
        <in></in>
        <ref></ref>
        <dband></dband>
        <period></period>
        <actuator></actuator>
        <P></P>
        <I></I>
        <D></D>
        <enable></enable>
</PIDD>
```

Parameters:

Output	Type	Resources available	Format	Description
UP	D	AI(V), AI(S), AO, AT	0 / 1	Actuator UP command
DOWN	D	AI(V), AI(S), AO, AT	0 / 1	Actuator DOWN command
RESET	D	AI(V), AI(S), AO, AT	0 / 1	Actuator RESET command

Input	Type	Resources available	Format	Description
IN	N	AI, AO, AM, AT	any	Value to adjust
REF	N	AI, AO, AM, AT, SP, KK	come IN	Reference value
DBAND	N	AI, AO, AM, AT, SP, KK	come IN	Dead band
PERIOD	N	AI, AO, AM, AT, SP, KK	seconds	Regulation period
ACTUATOR	N	AI, AO, AM, AT, SP, KK	seconds	Actuator time
D	N	AI, AO, AM, AT, SP, KK	0…100%	Proportional
I	N	AI, AO, AM, AT, SP, KK	0…100%	Differential
D	N	AI, AO, AM, AT, SP, KK	0…100%	Derivative
ENABLE	D	DI, DO, DT, AL, ST	0 / 1	Enable digital PID

Description:

The parameter <up> defines the output digital resource used by the PID regulator to increase the command towards the actuator.

The parameter <down> defines the output digital resource used by the PID regulator to decrease the command towards the actuator.

The parameter <reset> defines the output digital resource activated by the PID regulator when it is disabled (input <enable> deactivated). If the actuator manages the reset input, this output allows to bring the actuator back to the stand-by position.

The <reset> parameter is optional; it is not supposed to be assigned.

The parameter <in> defines the analogue measure to regulate.

The parameter <ref> defines the set point value to which the analogue measure should tend. The PIDD controls the outputs <up> and <down> to have <in> equal to <ref>.

The parameter <dband> defines the minimum error (between value to adjust and set point), below which no correction is made on the output (dead band). If you desire the maximum accuracy, you need to have the dead band disabled by setting this parameter to “0”.

For example, if in the temperature regulation you would like to accept an error of +/- 1°C, this parameter must be set to 1.0. So, if the difference between <in> and <ref> is lower than the dead band, no outputs command <up> and <down> will be created. This allows to preserve the actuator from continuous unnecessary commands.

The parameter <period> defines the sampling period of the input and the regulation period of the output commands <up> and <down> towards the actuator. The <up> and <down> commands can have a minimum duration equal to 10% and a maximum one 90% of this value (e.g. by setting a one second period, the minimum width of the impulse will be 100msec, while the maximum one will be 900msec).

The parameter <actuator> defines the time the actuator needs to “move” from the minimum position (0%) to the maximum one (100%).

The parameter <P> defines the proportional part of the PID regulator.

The parameter <I> defines the integrative part of the PID regulator.

The parameter <I> defines the derivative part of the PID regulator.

The parameter <enable> defines the digital resource that enables the PID regulator. If no resource is assigned, the PID regulator stays enabled.

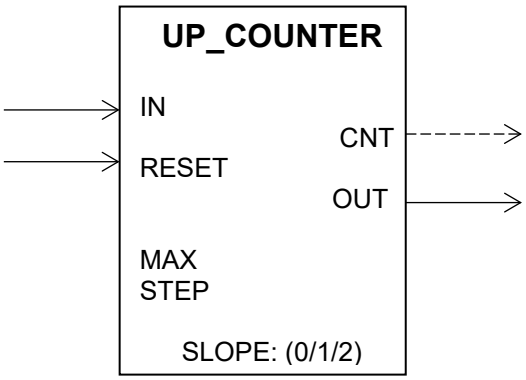
Example:

```
<PIDD number="1" xpos="0" ypos="0" description="Temperature control">
        <up>DO_CONTROLLER_01</up>
        <down>DO_CONTROLLER_02</down>
        <reset></reset>
        <in>AI_DITEMP_01_01</in>
        <ref>75.0</ref>
        <dband>0</dband>
        <period>1.0</period>
        <actuator>10.0</actuator>
        <P>SP_001</P>
        <I>0.1</I>
        <D>0</D>
        <enable></enable>
</PIDD>
```

In the previous example, the PID regulator is used to regulate the temperature acquired by the input 1 of the first DIGRIN to a 75°C set point. The output command towards the actuator is managed by the first two digital outputs of the controller. The “dead band” is disabled to have the maximum accuracy. The sampling period is set to one second and therefore the up and down commands can have a minimum duration of 100msec and maximum one of 900msec, while the actuator time is 10 seconds. The proportional <P> (adjustable on the controller through the first set point) and integrative <I> parts are used, while the derivative <D> one is not used. The regulator cannot be disabled and no <reset> output is considered.

4.10 UP COUNTER

Symbol:



Syntax:

```
<UP_COUNTER number="1" xpos="0" ypos="0" description="">
        <slope></slope>
        <cnt></cnt>
        <out></out>
        <in></in>
        <reset></reset>
        <max></max>
        <step></step>
</UP_COUNTER>
```

Parameters:

Output	Type	Resources available	Format	Description
CNT	N	AI(V), AI(S), AO, AT	as step	Counter
OUT	D	DI(V), DI(S), DO, DT		Digital output end count

Input	Type	Resources available	Format	Description
IN	D	DI, DO, DT, AL, ST	0 / 1	
RESET	D	DI, DO, DT, AL, ST	0 / 1	
MAX	N	AI, AO, AM, AT, SP, KK	as step	Count limit
STEP	N	AI, AO, AM, AT, SP, KK	N	Quantity to sum at every event

Description:

The UP-COUNTER block counts the status changes of the selected input, by increasing the value of the counter by the quantity specified up to reach the maximum limit. If this limit is configured to zero, it will be used as free counter and the count will saturate at the maximum value of the resource.

The parameter <cnt> defines the numerical resource to use as counter. The field is optional and, if it is not defined, the counter block will use an internal memory that is not visible to the PLC logic.

The parameter <in> defines the digital resource on which the status changes are counted. If the controller status assigned is ST_112, ST_113 or ST_114, the counter can be used respectively as seconds, minutes or hour counter.

The parameter <out> defines the digital resource that is activated at the end of the count. This output is deactivated only with the <reset> command.

The parameter <reset> resets the digital output and the counter, restarting the count.

The parameters <out>, <in> and <reset> can work also with inverted polarity, by adding the sign "-" before the identifier.

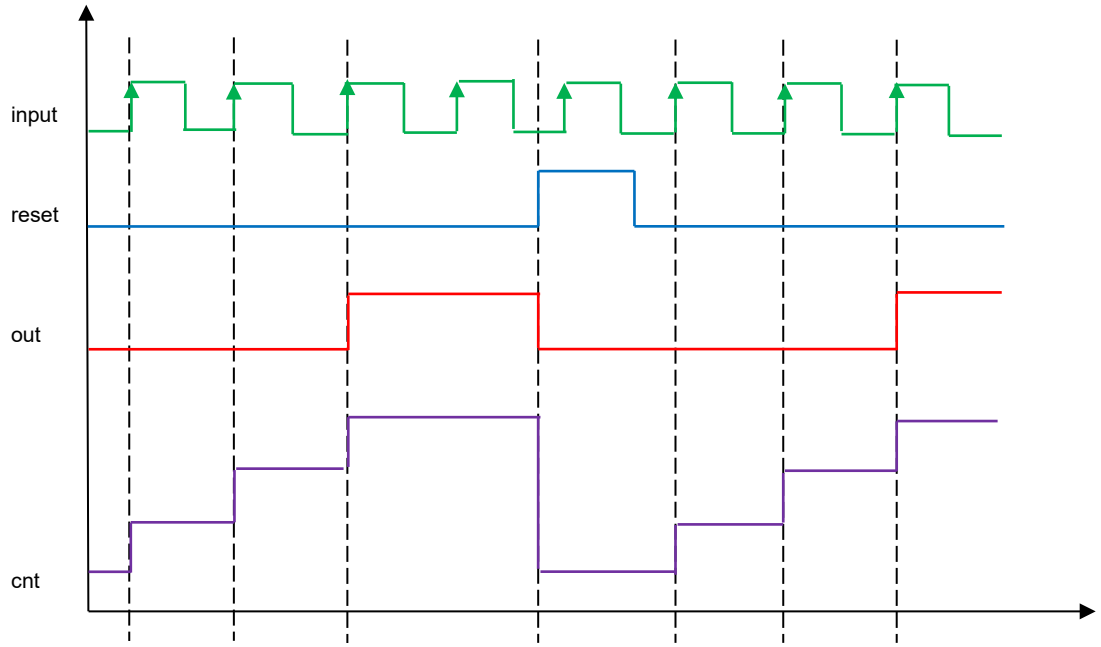
The parameter <step> represents the quantity to sum to the counter at every event (front) and determines the format of the numerical resources used by the PLC block. Possible incongruities will be signalled when compiling the PLC program.

The parameter <max> represents the value to which the count should end. If <max> is set to "0", the count will end when reaching the maximum value of the resource. Once the limit value is reached, possible new events won't be counted.

The parameter <slope> defines the edge to count:

- 0 = rising edge;
- 1 = falling edge
- 2 = both edges.

NOTE: The resource available to the block are not recorded in the non-volatile memory; therefore, when the system is off the count will restart from zero.



Example:

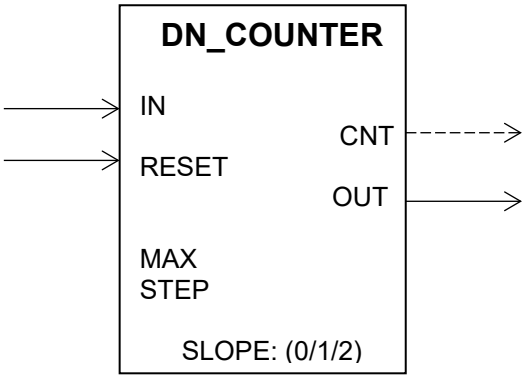
```
<UP_COUNTER number="1" xpos="0" ypos="0" description="">
    <slope>0</slope>
```

```
        <cnt>AT_001</cnt>
        <out>DO_CONTROLLER_01</out>
        <in>DI_CONTROLLER_01</in>
        <reset>DI_CONTROLLER_02</reset>
        <max>3</max>
        <step>1</step>
</UP_COUNTER>
```

In the previous example, the counter AT_001 is increased by 1 at every rising edge of the first digital input of the controller. Once the value 3 (<max>) is reached, the first digital output of the controller is activated and the counter is no more increased until it is reset with the activation of the second digital input of the controller <reset>.

4.11 DOWN COUNTER

Symbol:



Syntax:

```
<DN_COUNTER number="1" xpos="0" ypos="0" description="">
        <slope></slope>
        <cnt></cnt>
        <out></out>
        <in></in>
        <reset></reset>
        <max></max>
        <step></step>
</DN_COUNTER>
```

Parameters:

Output	Type	Resources available	Format	Description
CNT	N	AI(V), AI(S), AO, AT	as step	Counter
OUT	D	DI(V), DI(S), DO, DT		Digital output end count

Input	Type	Resources available	Format	Description
IN	D	DI, DO, DT, AL, ST	0 / 1	
RESET	D	DI, DO, DT, AL, ST	0 / 1	
MAX	N	AI, AO, AM, AT, SP, KK	as step	Count limit
STEP	N	AI, AO, AM, AT, SP, KK	N	Quantity to subtract at every event

Description:

The DOWN COUNTER block counts the status changes of the selected input, by decreasing the value of the counter by the quantity specified, from the maximum value up to reach the minimum zero.

The parameter <cnt> defines the numerical resource to be used as counter. The field is optional and, if it is not defined, the counter block will use an internal memory that is not visible to the PLC logic.

The parameter <in> defines the digital resource on which the status changes are counted. If the controller status assigned is ST_112, ST_113 or ST_114, the counter can be used respectively as countdown of seconds, minutes or hour.

The parameter <out> defines the digital resource activated when the counter becomes equal to zero. This output is deactivated only with the <reset> command.

The parameter <reset> resets the digital output and reloads the counter with the configured limit value, restarting the count.

The parameters <out>, <in> and <reset> can work also with inverted polarity, by adding the sign "-" before the identifier.

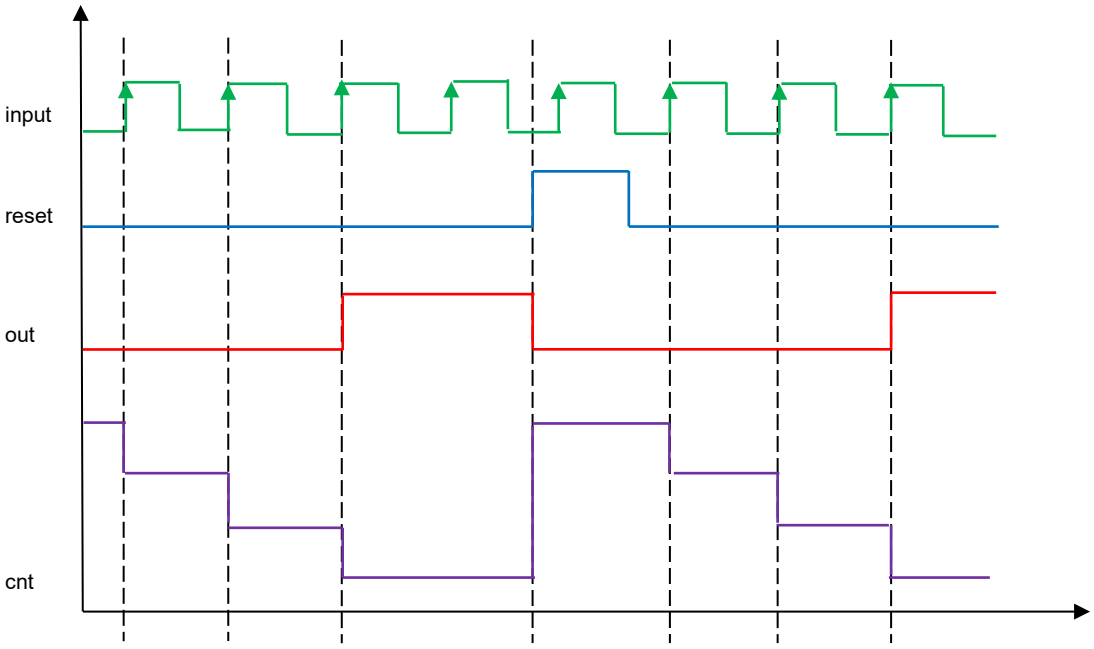
The parameter <step> represents the quantity to subtract to the counter at every event (front) and determines the format of the numerical resources used by the PLC block. Possible incongruities will be signalled when compiling the PLC program.

The parameter <max> represents the value from which the count starts. If <max> is set to "0", the count will start from the maximum value of the resource and will end when reaching "0". Once the limit value is reached, possible new events won't be counted.

The parameter <slope> defines the edge to count:

- 0 = rising edge;
- 1 = falling edge
- 2 = both edges.

NOTE: The resource available to the block are not recorded in the non-volatile memory; therefore, when the system is off the count will restart from the maximum value.



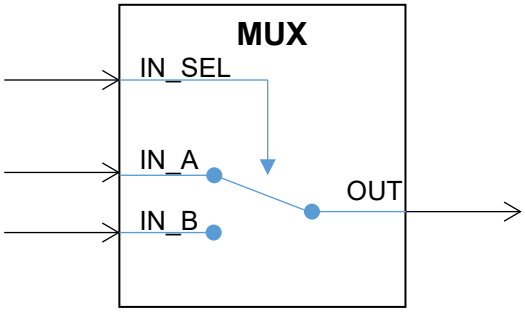
Example:

```
<DN_COUNTER number="1" xpos="0" ypos="0" description="">
        <slope>0</slope>
        <cnt>AT_001</cnt>
        <out>DO_CONTROLLER_01</out>
        <in>DI_CONTROLLER_01</in>
        <reset>DI_CONTROLLER_02</reset>
        <max>3</max>
        <step>1</step>
</DN_COUNTER>
```

In the previous example, the counter AT_001 is decreased by 1 at every rising edge of the first digital input of the controller. Once the value 0 is reached: the first digital output of the controller is activated and the counter is not decreased until it is recharged to the value 3 (<max>) with the activation of the second digital input of the controller <reset>.

4.12 MULTIPLEXER

Symbol:



Syntax:

```
<MUX number="1" xpos="0" ypos="0" description="">
```

```
        <out></out>
        <in_sel></in_sel>
        <in_a></in_a>
        <in_b></in_b>
</MUX>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	D/N	DI(V), DI(S), DO, DT, AI(V), AI(S), AO, AT	D/N	Output

Input	Type	Resources available	Format	Description
IN_A	D	DI, DO, DT, AL, ST AI, AO, AM, AT, SP, KK	as OUT	Input A
IN_B	D	DI, DO, DT, AL, ST AI, AO, AM, AT, SP, KK	as OUT	Input B
IN_SEL	N	DI, DO, DT, AL, ST	0 / 1	Selection input

Description:

The MULTIPLEXER block selects the value to copy on the output between two input signals, according to the “selection input” value. If the selection input is equal to zero, it copies the input A on the output, while if it is equal to one it copies the input B.

The block can operate with both digital and numerical resources, provided that the same type of resources are used. The type of resource used as output defines if the block is digital or numerical. In case of digital resources, both the output and the single input can be inverted.

The parameter <in_sel> defines the digital resource that selects the input to copy on the output.

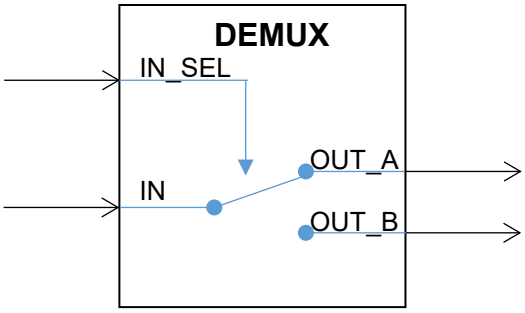
Example:

```
<MUX number="1" xpos="0" ypos="0" description="">
        <out>AO_CONTROLLER_01</out>
        <in_sel>DI_CONTROLLER_01</in_sel>
        <in_a>AI_CONTROLLER_01</in_a>
        <in_b>100</in_b>
</MUX>
```

In the previous example, the MUX block copies the value of the first analogue input on the first analogue input of the controller if the digital input 1 is off; the constant value 100 if the digital input 1 is on.

4.13 DEMULTIPLEXER

Symbol:



Syntax:

```
<DEMUX number="1" xpos="0" ypos="0" description="">
        <in></in>
        <in_sel></in_sel>
        <out_a></out_a>
        <out_b></out_b>
</DEMUX>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT_A	D/N	DI(V), DI(S), DO, DT, AI(V), AI(S), AO, AT	as IN	Output A
OUT_B	D/N	DI(V), DI(S), DO, DT, AI(V), AI(S), AO, AT	as IN	Output B

Input	Type	Resources available	Format	Description
IN	D	DI, DO, DT, AL, ST AI, AO, AM, AT, SP, KK	D/N	Input
IN_SEL	N	DI, DO, DT, AL, ST	0 / 1	Selection input

Description:

The DEMULTIPLEXER block carries out the operation opposite to the multiplexer, that is the value of the input is copied on one of the two outputs, according to the value of the “selection input”. If the selection input is equal to zero, it copies the input on the output A, while if it is equal to one it copies it on the output B.

The block can operate with both digital and numerical resources, provided that the same type of resources are used. The type of resource used as input defines if the block is digital or numerical. In case of digital resources, both the input and the single output can be inverted.

The parameter <in_sel> defines the digital resource that selects the input to copy on the output.

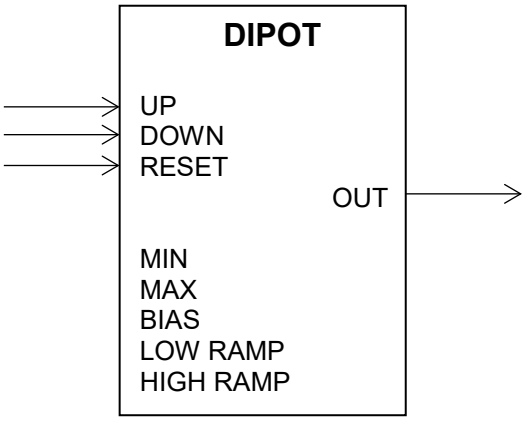
Example:

```
<DEMUX number="1" xpos="0" ypos="0" description="">
        <in>AI_CONTROLLER_01</in>
        <in_sel>DI_CONTROLLER_01</in_sel>
        <out_a>AO_CONTROLLER_01</out_a>
        <out_b>AO_CONTROLLER_02</out_b>
</DEMUX>
```

In the previous example, the DEMUX block copies the value of the first analogue input on the first analogue output of the controller if the digital input 1 is off, or on the second analogue output if the digital input 1 is on.

4.14 DIPOT

Symbol:



Syntax:

```
<DIPOT number="1" xpos="0" ypos="0" description="">
        <out></out>
        <up></up>
        <down></down>
        <reset></reset>
        <max></max>
        <min></min>
        <bias></bias>
        <lo_ramp></lo_ramp>
        <hi_ramp></hi_ramp>
</DIPOT>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	N	Output

Input	Type	Resources available	Format	Description
UP	D	DI, DO, DT, AL, ST	0 / 1	Output increase input
DOWN	D	DI, DO, DT, AL, ST	0 / 1	Output decrease input
RESET	D	DI, DO, DT, AL, ST	0 / 1	Output reset input
MAX	N	AI, AO, AM, AT, SP, KK	N	Output maximum value
MIN	N	AI, AO, AM, AT, SP, KK	N	Output minimum value
BIAS	N	AI, AO, AM, AT, SP, KK	N	Output reset value
LO-RAMP	N	AI, AO, AM, AT, SP, KK	N	Low ramp (% / sec)
HI-RAMP	N	AI, AO, AM, AT, SP, KK	N	Speed ramp (% / sec)

Description:

Valid from PLC version 01.01

The DIPOT block (or digital potentiometer) increases or decreases its numerical output with the ramp and until reaching the lower or higher limit. When the increasing or decreasing input is active, in the first two seconds it uses the low ramp to increment or decrement the output. After two seconds, it will use the high ramp. If both inputs (<up> and <down>) are active simultaneously, the priority is given to the decreasing input.

The parameter <reset> is optional and, if it is active, it maintains the output to the reset value.

The parameter <bias> defines the value to set in the output when the <rest> input is active.

The parameter <min> defines the minimum value that the output can reach.

The parameter <max> defines the maximum value that the output can reach.

The parameter <lo_ramp> defines the variation percentage of the output per second and it is used in the first two seconds in which the increasing or decreasing input is active.

The parameter <hi_ramp> defines the variation percentage of the output per second and it is used after the two first seconds in which the increasing or decreasing input is active.

The variation value is calculated as the difference between the maximum and minimum value multiplied for the selected ramp. One tenth of the calculated value is applied to the output every 100msec (that is at every PLC scansion). The formula used is the following:

((max - min) * ramp) / 100

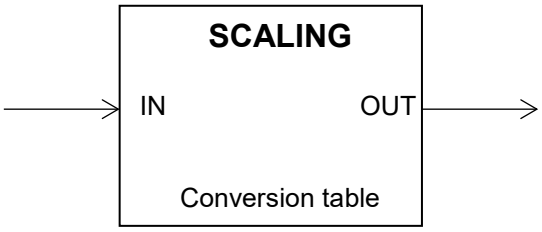
Example:

```
<DIPOT description="" number="1" xpos="0" ypos="0">
        <out>AO_CONTROLLER_01</out>
        <up>DI_CONTROLLER_01</up>
        <down>DI_CONTROLLER_02</down>
        <reset>DI_CONTROLLER_03</reset>
        <max>1000.0</max>
        <min>200.0</min>
        <bias>50.0</bias>
        <lo_ramp>20</lo_ramp>
        <hi_ramp>80</hi_ramp>
</DIPOT>
```

In the previous example, every 100msec, the DIPOT block increases the value of the first analogue output of the controller by 16 (low ramp) and by 64 (high ramp, after two seconds) when the first digital input of the controller is active. It decreases the output of the same value when the second digital input of the controller is active.

4.15 SCALING

Symbol:



Syntax:

```
<SCALE number="1" xpos="0" ypos="0" description="">
        <in></in>
```

```
        <out></out>
        <format></format>
        <point>
            <p_in></p_in>
            <p_out></p_out>
        </point>
</SCALE>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	N	Converted output

Input	Type	Resources available	Format	Description
IN	N	AI, AO, AM, AT, SP, KK	N	Input to convert

Description:

The SCALE block carries out the conversion of the numerical input value according to the conversion table defined by the user, and stores the result on the output. Moreover, it can be used to convert the numerical format from type 0 to type 1 and vice versa.

The block has a conversion table with variable number of points; it can contain from 0 up to 32 points. if no point is configured, the input value is directly stored on the output without any conversion.

The values in the table use the format Type 1 (23 whole bits + 8 fractional bits with sign).

Up to the PLC version 1.00 included, the point on the table can only be constants (KK). Starting from the PLC version 1.01, it is possible to use all types of numerical resources available (AI, AO, AM, AT, SP, KK) as points of the conversion table (both p_in and p_out).

Example:

```
<SCALE number="1" xpos="0" ypos="0" description="">
        <in>AI_CONTROLLER_01</in>
        <out>AO_CONTROLLER_01</out>
        <format>1</format>
        <point>
            <p_in></p_in>
            <p_out></p_out>
        </point>

</SCALE>
```

In the previous example, the SCALE block converts the value of the first analogue input on the first analogue output of the controller, according to the conversion table defined.

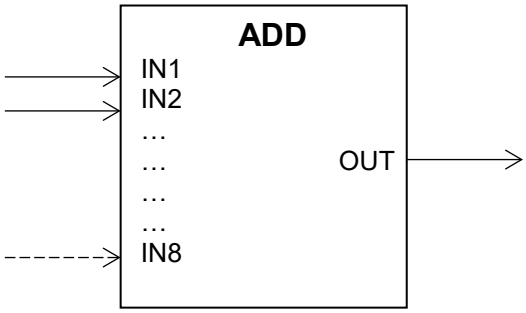
4.16 MATHEMATICAL FUNCTIONS

In the PLC, the mathematical functions are introduced by using a dedicate block for each mathematical operation.

The congruity of the format of the input resources (used as operands) and the output resource (used as result) is guaranteed when compiling the program (by the PLC compiler).

4.16.1 SUM

Symbol:



Syntax:

```
<ADD number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
        <in></in>
        …
        <in></in>
</ADD>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	N	Sum

Input	Type	Resources available	Format	Description
IN1…IN8	N	AI, AO, AM, AT, SP, KK	N	Addends

Description:

The SUM block carries out the mathematical operation of SUM on 2 or more numerical inputs (addends, min. 2 - max. 8) and stores the result on the output.

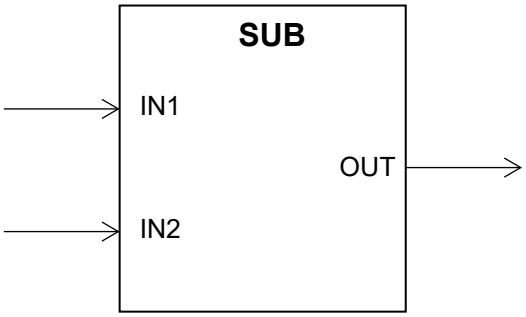
Example:

```
<ADD number="1" xpos="0" ypos="0" description="">
        <out>AT_002</out>
        <in>AI_CONTROLLER_01</in>
        <in>SP_010</in>
        <in>5</in>
</ADD>
```

The previous block makes the mathematical sum of the first analogue input of the controller and the tenth set point and the constant value 5. The result is put in the second numerical temporary.

4.16.2 SUBTRACTION

Symbol:



Syntax:

```
<SUB number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
        <in></in>
</SUB>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	N	(a) Difference

Input	Type	Resources available	Format	Description
IN (1)	N	AI, AO, AM, AT, SP, KK	N	(b) Minuend
IN (2)	N	AI, AO, AM, AT, SP, KK	N	(c) Subtrahend

Description:

The SUBTRACTION block carries out the mathematical operation of subtraction (a = b - c) between two numerical inputs, and stores the result on the output, considering the possible sign.

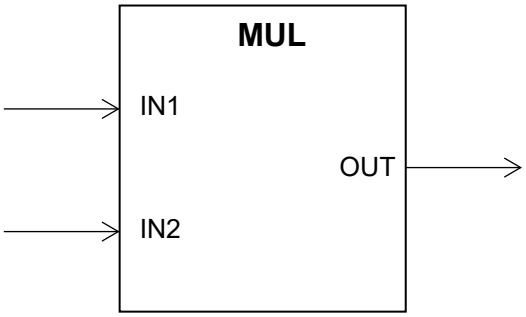
Example:

```
<SUB number="1" xpos="0" ypos="0" description="">
        <out>AT_001</out>
        <in>AI_CONTROLLER_01</in>
        <in>AI_CONTROLLER_02</in>
</SUB>
```

The previous block makes the mathematical difference between the first two analogue inputs of the controller, and stores the result on the first numerical temporary.

4.16.3 MULTIPLICATION

Symbol:



Syntax:

```
<MUL number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
        <in></in>
</MUL>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	N	Product

Input	Type	Resources available	Format	Description
IN (1)	N	AI, AO, AM, AT, SP, KK	N	Multiplicand
IN (2)	N	AI, AO, AM, AT, SP, KK	N	Multiplier

Description:

The MULTIPLICATION block carries out the mathematical operation of multiplication between two numerical inputs, and stores the result on the output, considering the possible sign.

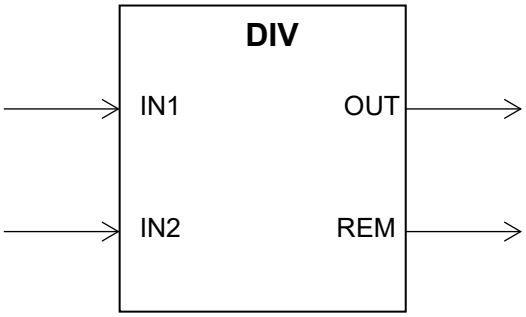
Example:

```
<MUL number="1" xpos="0" ypos="0" description="">
        <out>AT_001</out>
        <in>AI_CONTROLLER_01</in>
        <in>AI_CONTROLLER_02</in>
</MUL>
```

The previous block makes the mathematical multiplication between the first two analogue inputs of the controller and stores the result on the first numerical temporary.

4.16.4 DIVISION

Symbol:



Syntax:

```
<DIV number="1" xpos="0" ypos="0" description="">
        <out></out>
        <rem></rem>
        <in></in>
        <in></in>
</DIV>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT, ND	N	Quotient
REM	N	AI(V), AI(S), AO, AT, ND	N	Remainder (only whole numbers)

Input	Type	Resources available	Format	Description
IN (1)	N	AI, AO, AM, AT, SP, KK	N	Dividend
IN (2)	N	AI, AO, AM, AT, SP, KK	N	Divisor

Description:

If dividend, divisor or both are equal to zero, the result will be forced to zero.

The DIVISION block can operate with both integer and fractional numbers.

In case of division between integer numbers (resources type “0”), the DIVISION block carries out an integer division, reporting both the “quotient” and “remainder” on the outputs. The “remainder” resource can be omitted.

In case of division between fractional number (resources type “1”), the DIVISION block carries a floating-point division, reporting the result on the “quotient” output, considering the possible sign and rounding (the remainder is zero and the resource <rem> can be omitted).

The resource <out> must be always assigned.

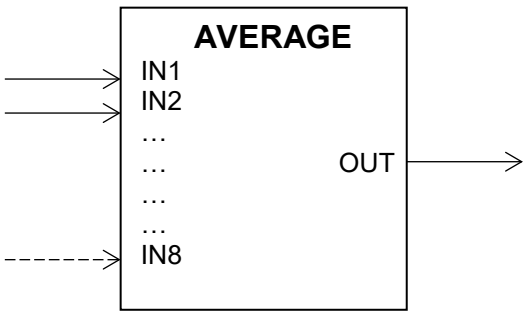
Example:

```
<DIV number="1" xpos="0" ypos="0" description="">
        <out>AT_002</out>
        <rem></rem>
        <in>AI_CONTROLLER_01</in>
        <in>AI_CONTROLLER_02</in>
</DIV>
```

The previous block makes the mathematical division between the first two analogue inputs of the controller and stores the result on the second numerical temporary.

4.16.5 AVERAGE

Symbol:



Syntax:

```
<AVERAGE number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
        <in></in>
        …
        <in></in>
</AVERAGE>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	N	Average

Input	Type	Resources available	Format	Description
IN1…IN8	N	AI, AO, AM, AT, SP, KK	N	Operand

Description:

The AVERAGE block carries out the algebraical average of 2 or more numerical inputs (min. 2 - max. 8) and stores the result on the output.

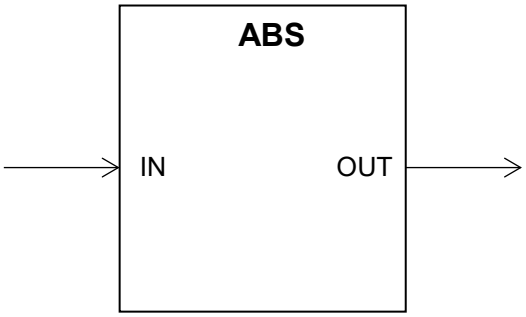
Example:

```
<AVERAGE number="1" xpos="0" ypos="0" description="">
        <out>AT_003</out>
        <in>AI_DIVIT_01_01</in>
        <in>AI_DIVIT_01_02</in>
        <in>AI_DIVIT_01_03</in>
        <in>AI_DIVIT_01_04</in>
</AVERAGE>
```

The previous block makes the algebraical average of the first four analogue inputs of the DIVIT module, and stores the result on the third numerical temporary.

4.16.6 ABSOLUTE

Symbol:



Syntax:

```
<ABS number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
</ABS>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	N	Result

Input	Type	Resources available	Format	Description
IN	N	AI, AO, AM, AT, SP, KK	N	Operand

Description:

The ABSOLUTE block stores the absolute value (without sign) of the input resource back to the output resource.

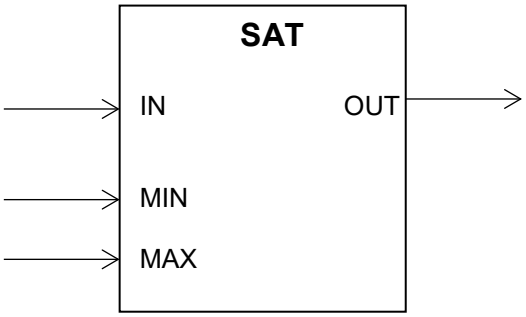
Example:

```
<ABS number="1" xpos="0" ypos="0" description="">
        <out>AT_001</out>
        <in>AI_CONTROLLER_01</in>
</ABS>
```

The previous block stores the absolute value (without sign) of the first analogue input of the controller back to the first temporary resource.

4.16.7 SATURATION

Symbol:



Syntax:

```
<SAT number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
        <min></min>
        <max></max>
</SAT>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	N	Result

Input	Type	Resources available	Format	Description
IN	N	AI, AO, AM, AT, SP, KK	N	Operand
MIN	N	AI, AO, AM, AT, SP, KK	N	Minimum value
MAX	N	AI, AO, AM, AT, SP, KK	N	Maximum value

Description:

The SATURATION block checks if the value of the input resource is compliant with the minimum and maximum limits. If higher than the maximum limit, it forces the maximum value in the output resource. If lower than the minimum limit, it forces the minimum value in the output resource. If the limit value is omitted (undefined variable), the control is carried out using the minimum and maximum absolute limits of the variable.

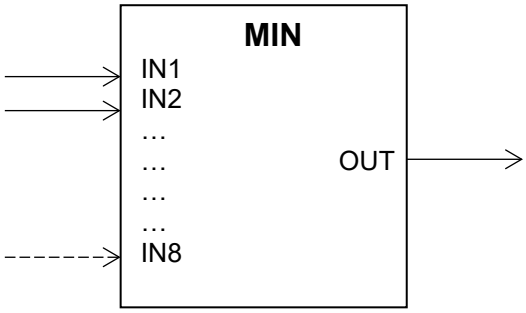
Example:

```
<SAT number="1" xpos="0" ypos="0" description="">
        <out>AI_VIRTUAL_01</out>
        <in>AI_DITEMP_01_01</in>
        <min>-5.0</min>
        <max>25.0</max>
</SAT>
```

The previous block stores into the first virtual analogue input -5 if the value read by the first input of the DITEMP module is lower than -5, or 25, if the value is higher than 25.

4.16.8 MINIMUM

Symbol:



Syntax:

```
<MIN number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
```

```
        <in></in>
        …
        <in></in>
</MIN>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	N	Average

Input	Type	Resources available	Format	Description
IN1…IN8	N	AI, AO, AM, AT, SP, KK	N	Operand

Description:

The MINIMUM block stores the lowest value of the inputs (min. 2 - max.8) back to the numerical output.

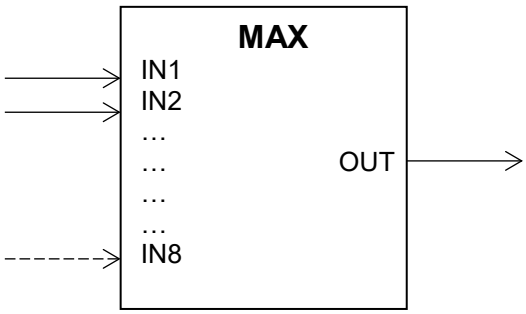
Example:

```
<MIN number="1" xpos="0" ypos="0" description="">
        <out>AT_003</out>
        <in>AI_DIVIT_01_01</in>
        <in>AI_DIVIT_01_02</in>
        <in>AI_DIVIT_01_03</in>
        <in>AI_DIVIT_01_04</in>
</MIN>
```

The previous block stores back into the third numerical temporary the minimum value among the first four analogue inputs of the DIVIT module.

4.16.9 MAXIMUM

Symbol:



Syntax:

```
<MAX number="1" xpos="0" ypos="0" description="">
        <out></out>
        <in></in>
        <in></in>
        …
        <in></in>
</MAX>
```

Parameters:

Output	Type	Resources available	Format	Description
OUT	N	AI(V), AI(S), AO, AT	N	Average

Input	Type	Resources available	Format	Description
IN1…IN8	N	AI, AO, AM, AT, SP, KK	N	Operand

Description:

The MAXIMUM block stores back the highest value of the inputs (min. 2 - max.8) to the numerical output.

Example:

```
<MAX number="1" xpos="0" ypos="0" description="">
        <out>AT_003</out>
        <in>AI_DIVIT_01_01</in>
        <in>AI_DIVIT_01_02</in>
        <in>AI_DIVIT_01_03</in>
        <in>AI_DIVIT_01_04</in>
</MAX>
```

The previous block gives back to the third numerical temporary resource the maximum value among the first four analogue inputs of the DIVIT module.

5. PLC Editor (Mecc Alte PlcEditor)

"Mecc Alte PlcEditor" is an application developed for PC in Java environment, that allows you to graphically create and modify the PLC program. The application simplifies the drafting by making available the blocks of the PLC functions, in graphic format, which then needs to be filled by the user. From version 2.08 it also manages the communication with the controller, allowing transmission and reading of the PLC program; it can also show the real-time value of all used resources.

5.1 How to run the application

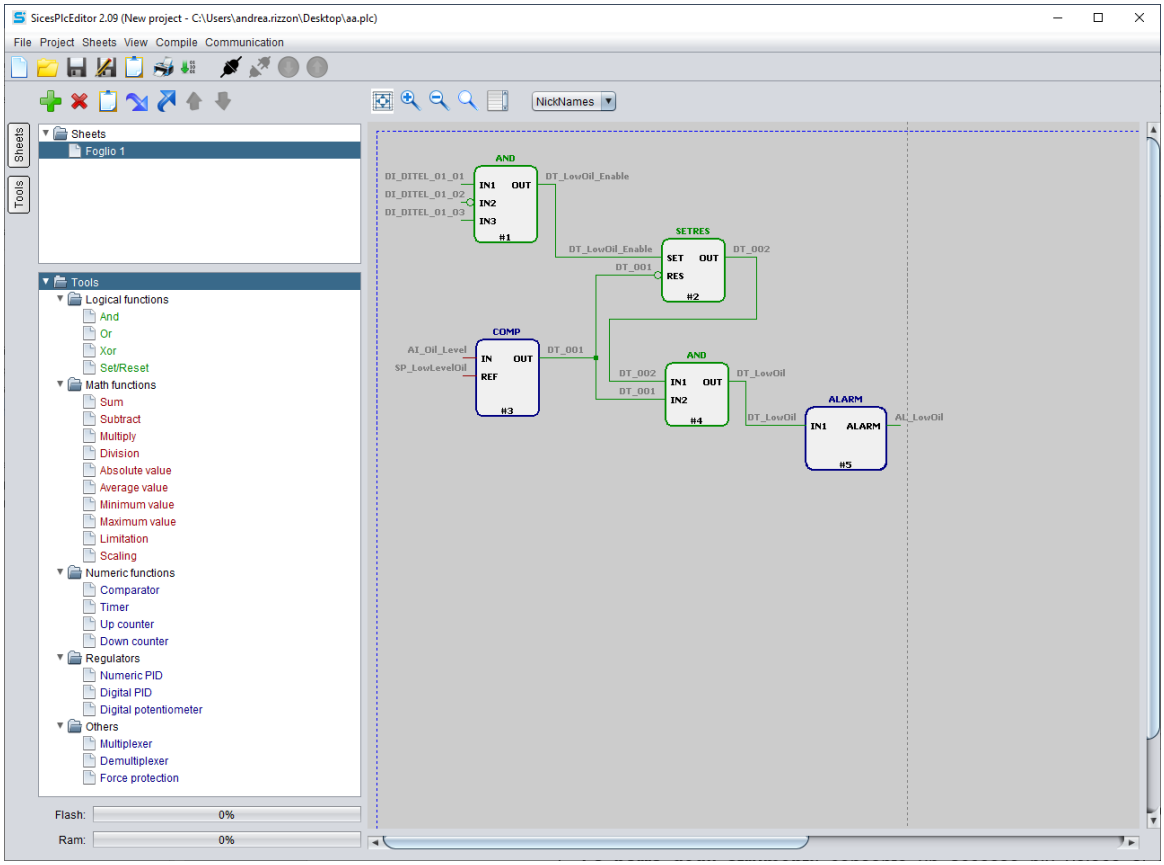
The “Mecc Alte PlcEditor” can be run by the Start menu in Windows:

“Start” → “Programs” → “Mecc Alte” → “Mecc Alte PlcEditor” → “Mecc Alte PlcEditor”.

5.2 How to end the application

The application can be ended by closing the main window.

5.3 Description of the main window



The main window of Mecc Alte PlcEditor is composed by:

1. **Menu bar**: it contains the command and the options that can be activated by the program, grouped by functions into the menu tree.
2. **Tools bar**: it allows a rapid access to the most used commands. It simplifies the use of the commands, as it associates an icon to each command, which make the purpose immediately understandable.

3. **Editor of the program**: it is in the right part of the window; it displays and allows to write the PLC program, in graphic format.
4. **PLC pages display**: it is in the left part of the window and it is identified as “Sheets”, allowing to display and arrange the PLC logic on more sheets. For every sheet, it is possible to define the name and the PLC logic desired. It is possible to hide/show it by clicking on the “Sheet” button.
5. **PLC functions display**: it is in the left part of the window and it is identified as “Tools”, displaying all the blocks available divided per function. The name identifies the model of the PLC block. With a double-click on the name, the block is introduced in the Editor. The user must fill in the different fields according to the needs of the PLC program to create (by opening the window related to the block with a double-click). It is possible to hide/show it by clicking on the “Tools” button.
6. **PLC program dimension display**: it is in the bottom-left part of the window and it is composed by two progress bars that identify respectively the dimension of the PLC program (Flash) and the total RAM quantity used by the PLC blocks (RAM).

5.3.1 Menu

5.3.1.1 File Menu

- **Language**: allows to select the language for the Mecc Alte PlcEditor program.
- **Check for updates**: checks if there are updates available on Mecc Alte Servers for Mecc Alte PlcEditor (in case it warns the operator). This item can be quickly selected with the CTRL+U keys combination.
- **Exit**: it allows to exit the Mecc Alte PlcEditor program.

5.3.1.2 Project Menu

-  **New project**: it allows to create an empty PLC program.
-  **Open project**: it allows to open a program already existing.
-  **Recent projects**: it allows to open one of the most recent programs.
-  **Save current project**: it allows to save the current PLC program.
-  **Save current project as**: it allows to save the current PLC program, with a different name.
-  **Change current project’s properties**: it allows to modify the title, the description, the PLC version, the password, the controller type with related Hardware and Software codes. The first three information will be displayed on the related controller on the upper status window L.01 (PLC Status).

  The password enables the visualisation of the PLC code on the controller by means of the proper window L.02 (PLC Logic). The visualisation is enabled only if the password set corresponds to the parameter P.0007 - PLC Password. It is also required by Mecc Alte PlcEditor when trying to open a protected PLC program.

5.3.1.3 Sheets Menu

-  **New sheet**: it allows to create a new sheet in the PLC program.
-  **Remove current sheet**: it allows to remove an existing sheet from the PLC program.

-  **Change current sheet's properties**: it allows to change the current sheet properties (that is title and description).
-  **Import a sheet**: it allows to import a sheet from another PLC program.
-  **Export a sheet**: it allows to export the current sheet to be introduces in another PLC program.

5.3.1.4 View Menu

- **Show resources**: select the mode in which the resources are shown in the general diagram:
  - **by IDs:** the program shows the resource identifiers (for example DI_CONTROLLER_01). This item can be quickly selected with the CTRL+1 key combination.
  - **by symbols:** the program shows the symbols (nickname) that the operator has associated with the resources. If a resource has no associated symbol, its ID is shown. This item can be quickly selected with the CTRL+2 key combination.
  - **by values:** option available only when the program is in communication with the controller. It shows real-time resource values (in red). This item can be quickly selected with the CTRL+3 key combination.
  - **by IDs and values:** option available only when the program is in communication with the controller. It shows resource identifiers (for example DI_CONTROLLER_01), followed (in red) by real-time resource values. This item can be quickly selected with the CTRL+4 key combination.
  - **By symbols and values:** option available only when the program is in communication with the controller. It shows the symbols (nickname) that the operator has associated with the resources, followed (in red) by the real-time values of the resources. If a resource has no associated symbol, its ID is shown. This item can be quickly selected with the CTRL+5 key combination.

5.3.1.5 Compile Menu

- **Options for compiler**: it allows to define the compiling options of the program.
-  **Compile current project**: compiling program of the PLC program.

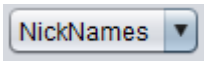
5.3.1.6 Communication Menu

- **Select the communication resource:** it displays a list of the communication resources available on the PC, that can be used for communication with the controller. After selecting one, the operator can configure additional options (for example the communication speed for serial ports). This item can be quickly selected with the CTRL+S key combination.
- **Select the address:** it allows to select the Modbus address of the controller. If the Ethernet port is used, it also allows you to select the IP address of the controller (the option to retrieve the IP address from the SMARTCLOUD server is available, in this case it is necessary to indicate the name with which the controller is registered into SMARTCLOUD). It also allows to indicate the communication timeouts and other options. This item can be quickly selected with the CTRL+A key combination.
-  **Connect:** it allows to activate the communication with the controller. This item can be quickly selected with the CTRL+N key combination.

-  **Disconnect:** it closes the communication with the controller. This item can be quickly selected with the CTRL+D key combination.
-  **Read from the device:** when the communication is active, it allows to read the PLC program from a controller and display it. This item can be quickly selected with the CTRL+R key combination.
-  **Send to device:** when the communication is active, it allows to transmit the current PLC program to the controller. This item can be quickly selected with the CTRL+W key combination.

5.3.2 Tools bar

The tools bar shows the same icons used in the menus. However, there are some commands that are available only in the command bar:

-  **Print**: it prints the current PLC program.
-  **Move up current sheet**: it changes the order of sheets in the PLC program.
-  **Move down current sheet**: it changes the order of sheets in the PLC program.  **Fit**: it changes the zoom to show the entire PLC program in the Editor.
-  **Zoom in**: it increases the size of the PLC blocks.
-  **Zoom out**: it reduces the size of PLC blocks.
-  **Zoom 100%**: it restores the standard size of the PLC blocks.
-  **Show resources**: it opens the resource editor.
- 

Resources visualization: quick access to the "View" menu commands via a drop-down box.

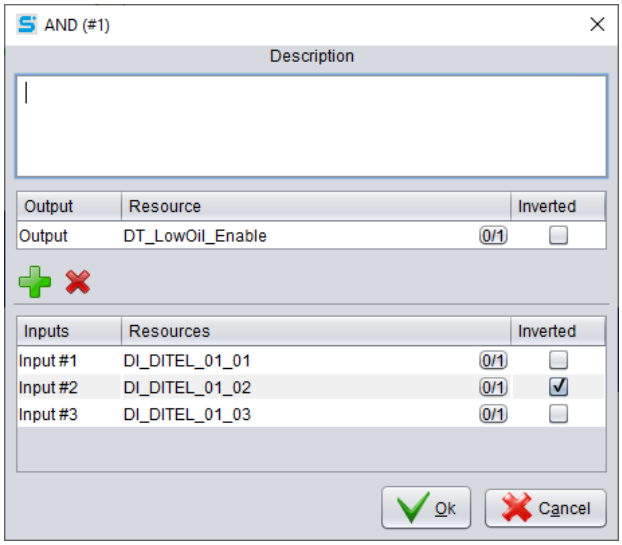
5.3.3 Editor of the program

The right part of the main window allows to write the PLC program in graphic format, following some guidelines:

- Select the desired block from the list, with a double-click it will be copied in the Editor area.
- Select the block and move it to the desired point of the sheet.
- Draw the graphic lines that connect blocks.
- Double click a block to open its own editor:
  - You can insert a comment.

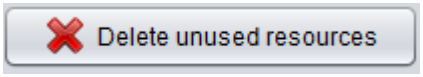
- Fill in the fields with the required resources, to implement the required features. The resources can be used with their IDs or with the symbols (if defined).
- The numerical constants must be typed directly (including possible decimal values separated by ","). The compiler will create the ordered list of the constants used in the PLC program.
- The digital status ST_998 always defines a digital resource at "1", while the ST_998 always at "0".
- The resources not required by the function can be omitted;

The following screen shows the parameters settings of an AND block:



5.3.4 Resources editor

Once the "Resource editor" window is opened, it is possible to manage the resources used by the PLC. In details:

-  it allows to add a new resource.
-  it allows to remove an existing resource.
-  it allows to remove all the resources defined but not used by the PLC program.
- **"Boolean"**: it allows to manage the digital resources.
- **"Numeric"**: it allows to manage the numerical resources.
- **"Setpoint"**: it allows to manage the setpoint resources.
- **"OK"**: it closes the window saving the changes.
- **"Cancel"**: it closes the window without saving the changes.

For each resource, it is possible to define:

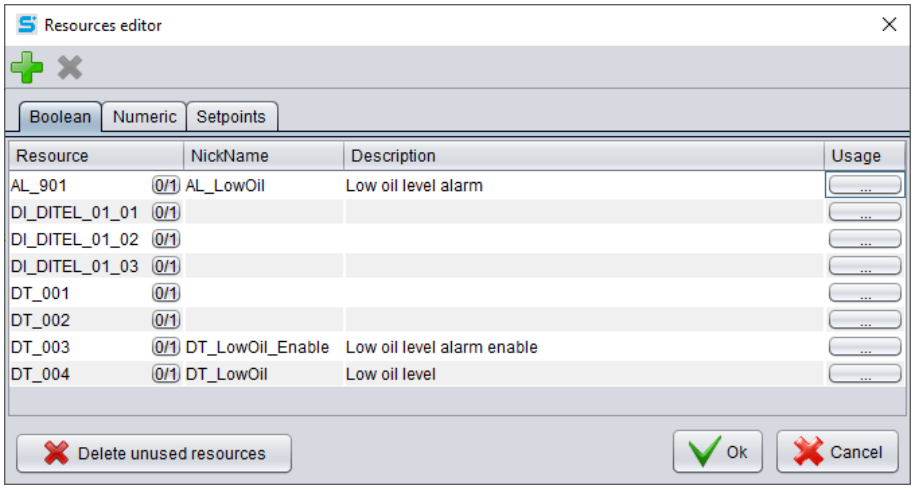
- **"Resource"**: name of the resource.
-  **or**  : it allows to open the list of the digital or numerical resources available, and to select the desired resource.

- **"Nickname"**: it allows to associate a mnemonic name to the resource.
- **"Description"**: it allows to associate a description to the resource. For the AL (alarm) resources, the description will be used as text of the alarm, while for the SP (setpoint) resources it will be used as name of the parameter.
- **"Usage"**: it allows to display the blocks where the resource is used in the PLC program.

For the setpoints, it is also possible to define the following additional options, used during the modification of the setpoint from the controller's panel or through BoardPrg3:

- **"Decimal digits"**: number of decimal digits used for the visualization of the setpoint.
- **"Default value"**: default value for the setpoint.
- **"Minimum value"**: minimum value for the setpoint.
- **"Maximum value"**: maximum value for the setpoint.
- **"Required password"**: password level required to modify the setpoint.

Below and example of the resources' settings page:



5.4 Compiling the PLC program

Once the PLC program is finished, it is necessary to compile it before sending it and running it on the controller. The program "Mecc Alte PlcEditor" allows the compiling by selecting "Compile current project" in the "Compile" menu, or by selecting the related command on the tools bar. If there are errors, a proper window will appear indicating the points to fix; otherwise, another window will indicate the correct compiling of the program.

6. PLC program transfer

6.1 Using Mecc Alte PlcEditor

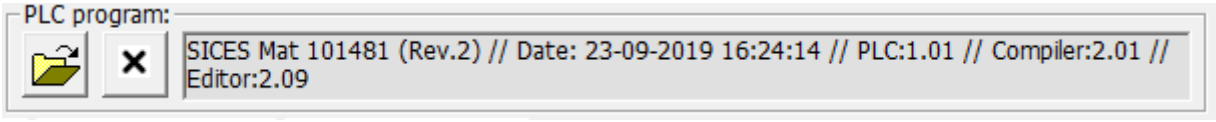
Starting from version 2.08, Mecc Alte PlcEditor implements the communication with the controller.

It is possible to send a PLC program to the controller using the "Send to device" item in the "Communication" menu (or the equivalent button in the tools bar).

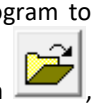
It is possible to read a program from the controller using the "Read from device" item in the "Communication" menu (or the equivalent button in the tools bar).

6.2 Using BoardPlc3

Inside BoardPrg3, in the upper part of the window there is a section dedicated to the PLC:



On the right side, the main information of the PLC program is displayed (title, compilation date, version of the Mecc Alte PlcEditor used to create the program etc.). This area is empty if the controller does not contain any PLC program.

To transmit a new PLC program to the controller, you must first load the file (compiled with Mecc Alte PlcEditor) using the button  , and then transmit it to the controller with the normal transmission command.

To remove the PLC program from the controller, it must first be deleted from BoardPrg3 with the button  , and then transmit to the controller with the normal transmission command.

By saving the parameters of the controller, in the same file "PAR" the PLC program is also saved, in a binary version.

7. DST4602 controllers

7.1 PLC Resources

The following table shows the resources available to the PLC integrated on DST4602:

ID. RESOURCE	TYPE	MIN	MAX	TOTAL	VER	PLC
DI_CONTROLLER_xx	Controller digital inputs	1	20..26	20..26	0.00	R
DI_VIRTUAL_xx	Virtual digital inputs	1	16	16	0.00	R / W
DI_DITEL_xx_xx	Expansion digital inputs	1	8 * 16	128	0.00	R
DI_DITEL_xx_xx	Expansion digital inputs	1	10 * 16	160	00.37	R
DO_CONTROLLER_xx	Controller digital outputs	1	16	16	0.00	R / W
DO_DITEL_xx_xx	Expansion digital outputs	1	8 * 16	128	0.00	R / W
DO_DITEL_xx_xx	Expansion digital outputs	1	10 * 16	160	00.37	R / W
DT_xxx	Digital temporary supports	1	256	256	00.04	R / W
DT_xxx	Digital temporary supports	1	512	512	00.37	R / W
AL_xxx	Generic alarm	1	300	192	0.00	R
	Analogue inputs	301	556	256	0.00	R
	Digital inputs	701	892	192	0.00	R
	PLC	901	964	64	00.04	R / W
ST_xxx	Controller digital statuses	0	999	112	0.00	R
AI_CONTROLLER_xx	Controller analogue inputs	1	6	6	0.00	R
AI_VIRTUAL_xx	Virtual analogue inputs	1	16	16	0.00	R / W
AI_DITEMP_xx_xx	DITEMP expansion analogue inputs	1	3 * 16	48	0.00	R
AI_DIVIT_xx_xx	DIVIT expansion analogue inputs	1	4 * 16	64	0.00	R
AO_CONTROLLER_xx	Controller analogue outputs	1	2	2	0.00	R / W
AO_DANOUT_xx_xx	Expansion analogue outputs	1	4 * 8	32	0.00	R / W
AM_xxx	Controller measurements (numerical)	1	150	150	00.04	R
AT_xxx	Numerical temporary support	1	64	64	00.04	R / W
SP_xxx	set points	1501	1562	62	00.04	R

7.2 PLC blocks operating time

The following table shows the maximum times, expressed in microseconds, used by the DST4602 controller to interpret each PLC block.

Nr.	BLOCK	TIME	NOTES
1	AND	6,1 us	2 input parameters
		18,7 us	10 input parameters
		34,6 us	20 input parameters
		52 us	31 input parameters
2	OR	6.1 us	2 input parameters
		18.7 us	10 input parameters
		34.6 us	20 input parameters
		52 us	31 input parameters
3	XOR	5.3 us	
4	SET / RESET	4.5 us	No input active
		6.1 us	At least one input active
5	ALARM	5 us	1 alarm
		13 us	4 alarms
6	COMPARATOR	7.5 us	
7.1	TIME DELAY	3,9 us	Stand-by
		5.2 us	When time passes
7.2	TIME IMPULSE	4.1 us	Stand-by
		6.4 us	When time passes
7.3	TIME PWM	6.7 us	
8	PIDN (analogue)	7 us	PID Regulation disabled
		31 us	PID Regulation enabled
9	PIDD (digital)	9 us	PID Regulation disabled
		42 us	PID Regulation enabled
10	UP COUNTER	10 us	
11	DOWN COUNTER	10 us	
12	MULTIPLEXER	6,5 us	Digital
		5.5 us	Analogue
13	DEMULTIPLEXER	6.8 us	Digital
		5.7 us	Analogue
14	DIPOT	9 us	Stand-by
		10 us	If the reset input is active
		18 us	If the decrease input is active
		20 us	If the increase input is active
15	SCALING	16 us	Ver.1.00 with 2 constant values in table

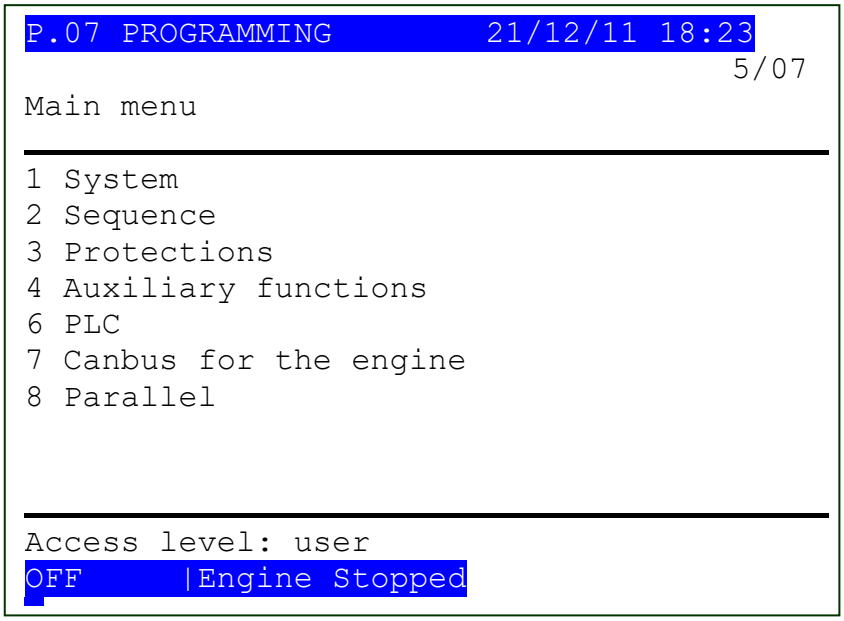
		25 us	Ver.1.00 with 32 constant values in table
		18 us	Ver.1.01 with 2 setpoints in table
		31 us	Ver.1.01 with 32 setpoints in table
16.1	SUM	5,3 us	2 input addends
		14 us	8 input addends
16.2	SUBTRACTION	4.6 us	
16.3	MULTIPLICATION	8.7 us	
16.4	DIVISION	9.1 us	
16.5	AVERAGE	5.6 us	2 input parameters
		14.3 us	8 input parameters
16.6	ABSOLUTE	3.4 us	
16.7	SATURATION	8.7 us	
16.8	MINIMUM	5.3 us	2 input parameters
		13.3 us	8 input parameters
16.9	MAXIMUM	5.3 us	2 input parameters
		13.3 us	8 input parameters

7.3 Mecc Alte controllers comparison

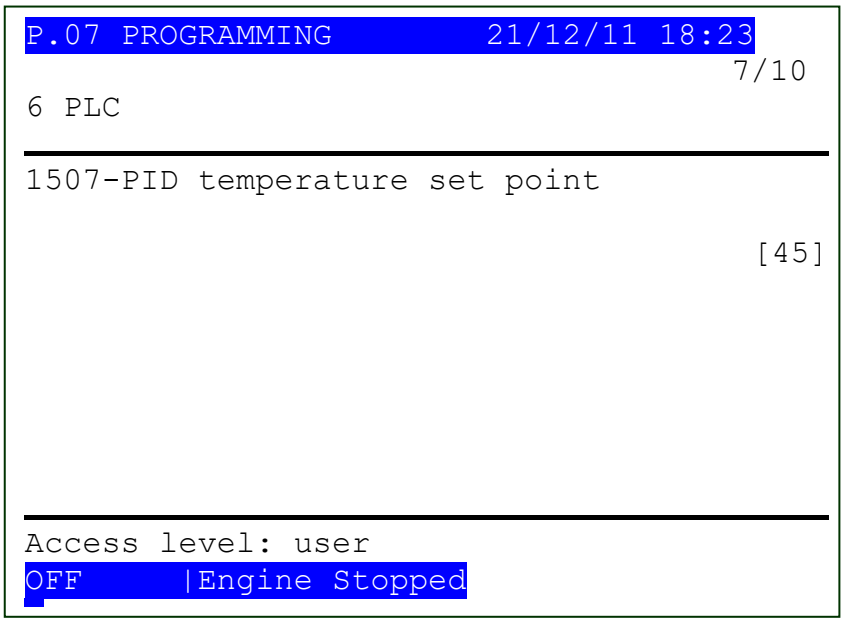
		DST4602	GC600	MC200	HS315
Digital inputs	**DI**	20 + 6 + 160	18 + 7 + 64	18 + 7 + 32	12 + 5 + 32
Digital virtual inputs	**DI(V)**	16	16	16	16
Digital shared inputs	***DI(S)***	*0*	*256*	*256*	*0*
Digital outputs	**DO**	16 + 160	18 + 64	18 + 32	12 + 32
Digital temporary	**DT**	512	256	256	256
Digital PLC alarms	**AL**	64	64	64	64
Digital statuses	**ST**	272	272	288	256
Numeric inputs	**AI**	6 + 48 + 64	7 + 30 + 20	7 + 9 + 8	5 + 6 + 4
Virtual numeric inputs	**AI(V)**	8	8	8	8
Virtual shared inputs	**AI(S)**	0	32	32	0
Virtual numeric inputs	**AI(V)**	8	8	8	8
Numeric outputs	**AO**	2 + 32	2 + 16	2 +16	1 + 4
Numeric temporary	**AT**	64	64	64	64
Internal measures	**AM**	168	151	128	151
Set-points PLC	**SP**	62	40	40	40

7.4 PLC set-point configuration

The 6-PLC menu allows to change the setpoint values used in the PLC code. It is displayed only if the controller is equipped with a valid PLC program that uses at least one setpoint. The following examples refer to the display of DST4602:



By pressing ENTER in 6-PLC, you activate the setpoint change procedure. On the DST4602 controller, 62 parameters are available starting from the index 1501.



You can change a parameter only if it is displayed between square brackets (**[ ]**); if parameter is displayed between the **< >** symbols, it cannot be modified. In this case, it could be necessary to set a new suitable password and/or move the key selector switch to the **OFF/RESET** mode.

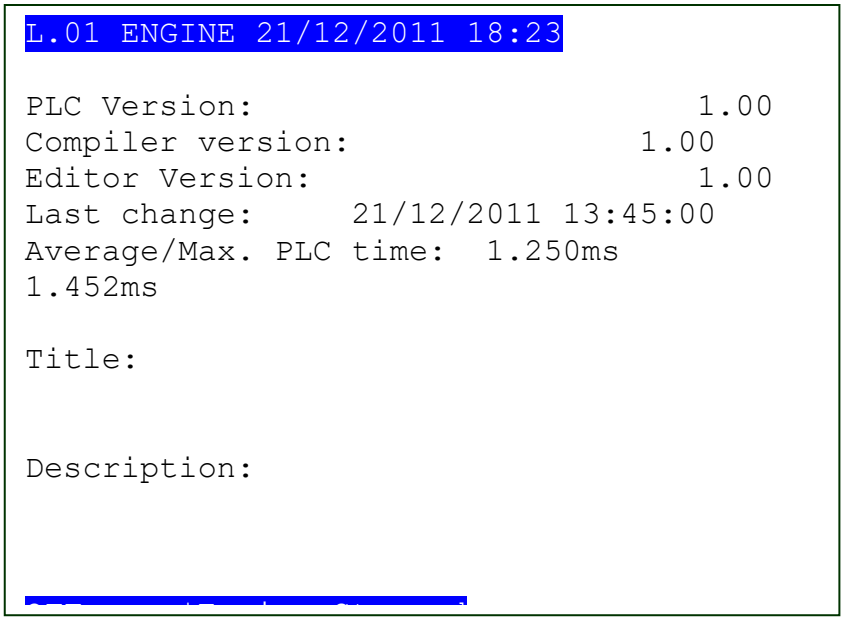
The password level associated to each parameter used by PLC is defined in the settings of the PLC resources by means of Mecc Alte PlcEditor.

7.5 PLC Status

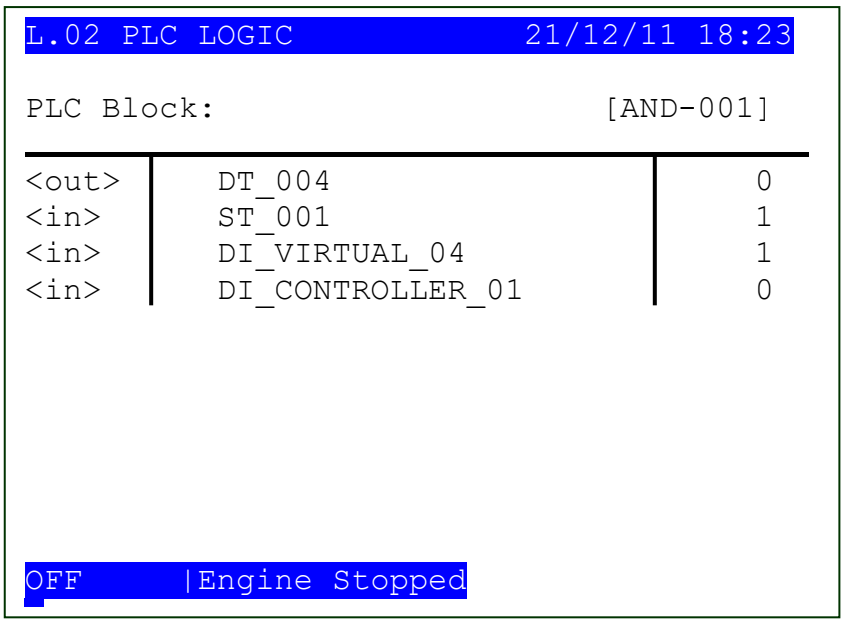
The status pages from **L.01** to **L.07** contain the information related to the PLC logic and they are displayed only if the controller is equipped with a valid PLC program.

The page **L.01 (PLC)** is displayed only if the controller is equipped with a valid PLC program. The page contains the identification information of the PLC program installed on the device, such as the PLC version, the compiler, the editor, the date of the last change, the average and maximum operating time, the title and the description of the PLC code.

The average and maximum operating time of the PLC are automatically reset when the PLC program is transferred to the controller or it is possible to force the reset by pressing the buttons ACK+EXIT for 5 seconds.

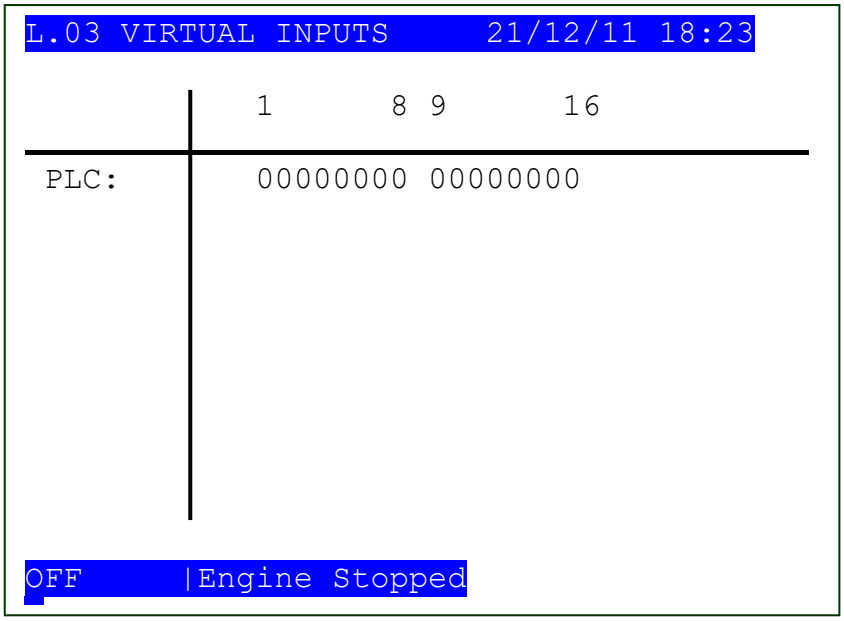


The page **L.02 (PLC LOGIC)** contains the information related to the single PLC block. The first column identifies the type of parameter used, the second identifies the resource used and the third one the current value of the resource. By pressing ENTER, you enable the block to display; so, with the UP and DOWN keys it is possible to scroll all the PLC logic.



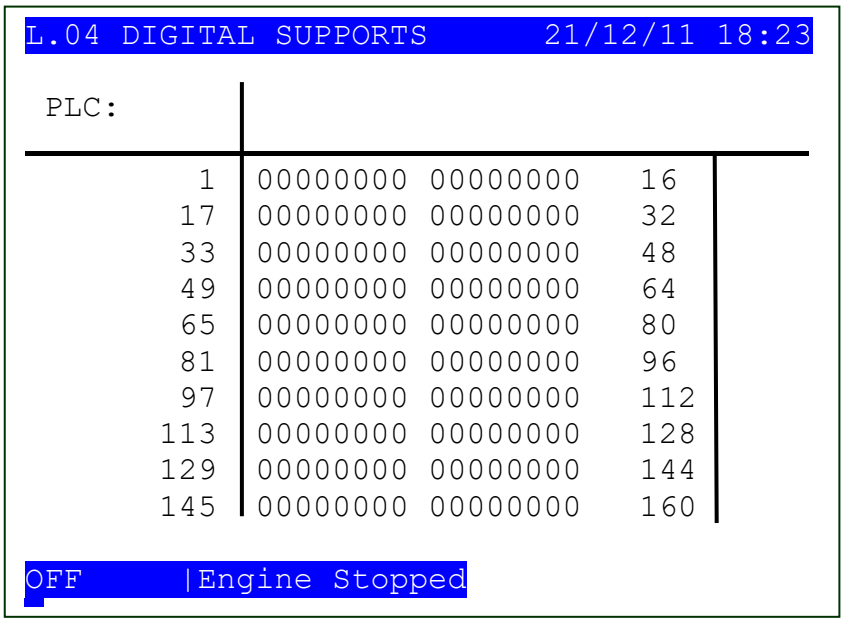
The page **L.03 (VIRTUAL INPUTS)** represents, in digital format, the status of the virtual digital inputs.

See 3.1.1DI - Digital Inputs



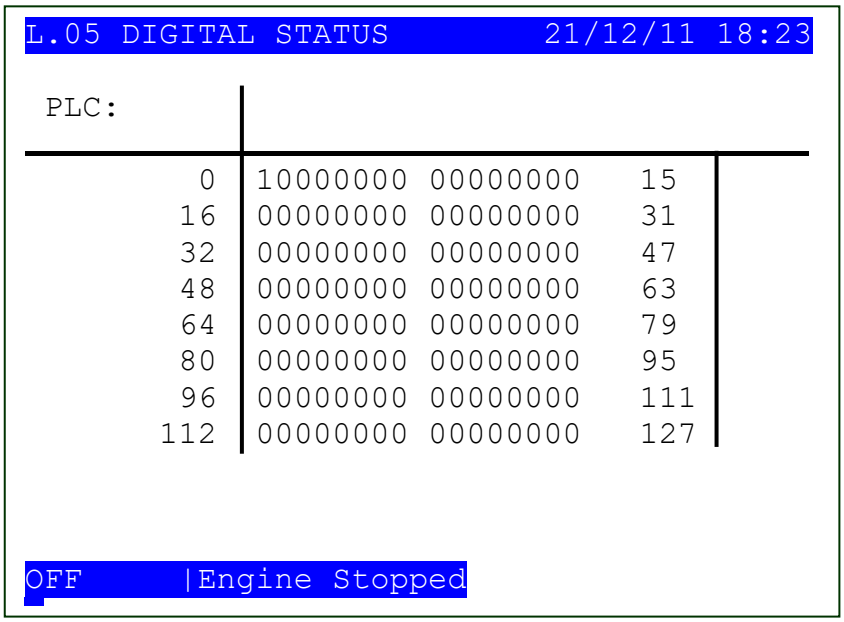
The page **L.04 (DIGITAL SUPPORTS)** represents, in digital format, the status of the temporary digital supports. There are more pages that alternate every 2 seconds to display all the digital supports used by PLC.

See 3.1.3 DT - Digital temporary supports



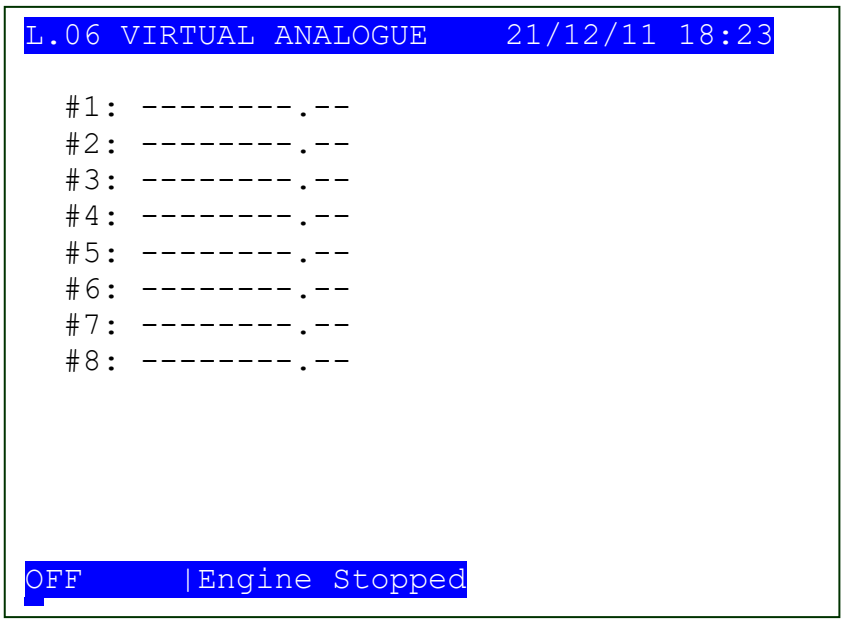
The page **L.05 (DIGITAL STATUS)** represents, in digital format, the status of the controller internal status.

See 3.1.5 ST - Statuses of the controller



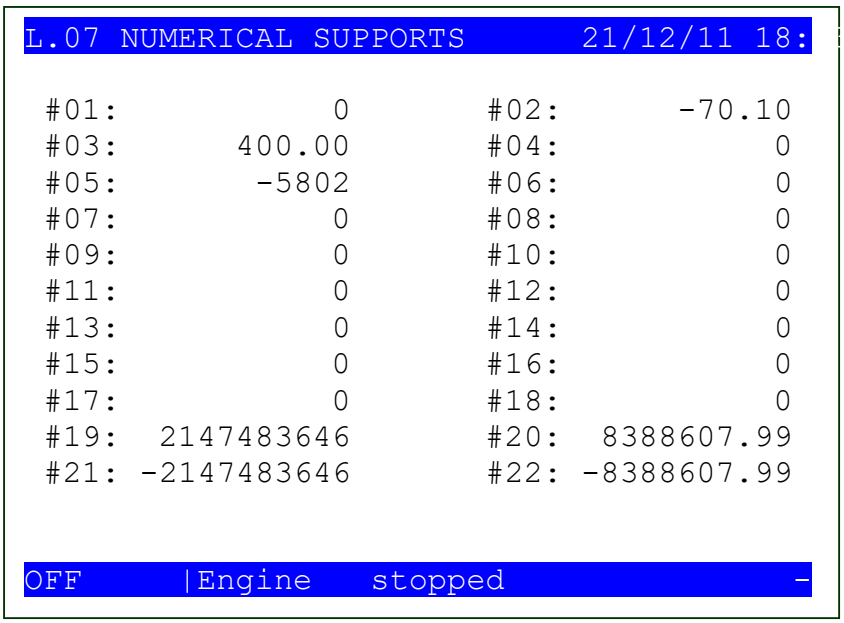
Page **L.06 (VIRTUAL ANALOGUE)** represents, in numerical format, the value of the virtual analogue inputs. The value --------.— indicates that the analogue input is not used.

See 3.2.1 AI - Analogue Inputs



The page **L.07 (NUMERICAL SUPPORTS)** represents, in numerical format, the status of the temporary numerical supports. There are more pages that alternate every 2 seconds to display all the numerical supports used by PLC.

See 3.2.3 AT – Numerical temporary support



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