atos
the smart electrohydraulics

USER MANUAL

S-MAN-S-BC

SMART SERVOPUMP SYSTEM
PROGRAMMING INSTRUCTIONS
CANopen PROTOCOL

INDEX

1 GENERAL

1.1 About this user manual

This manual describes the required information to operate Atos Smart ServopPump system (SSP) using CANopen fieldbus communication: always refer to the specific drive manual (see 1.2) for a complete description of the available function and of the parameters settings.

To speed up the fieldbus startup operations it is always recommended to use the Atos S-SW-SETUP programming software for PC before connecting Atos SSP to the fieldbus: S-SW-SETUP programming software allows a fast identification of the functions and parameters that would be included in the CANopen communication.

The purpose of this manual is not to cover all the details or variations of CANopen fieldbus, Atos drive and software, and it does not provide complete details for all possible working conditions; if any further information or technical support are required, please contact the Technical Sales Support of Atos Electronic Division (ele-support@atos.com).

In addition please follow up all the current regulations of the country/community where the drives will be used.

A basic skill in using personal computers and Windows® operating system is required.

For information about mechanical and electrical installation of a complete SSP system (drives, motors, pumps, fuses, inductances and wiring cable) please refer dedicated manual S-MAN-HW - see 1.2

1.2 Documentation

Additional information about electronic drives, motor, pump and Atos software can be found into the Atos web site or in the My Atos - Download Area.

Related documentations

- S-MAN-S-SW SSP programming software – user manual
- S-MAN-HW SSP system installation - user manual
- S-MAN-STO Safety Torque Off instruction – user manual
- AS050 Basics for Smart Servopumps - SSP - technical table
- AS100 Smart Servopumps - SSP- technical table
- AS200 Sizing criteria for Servopumps - technical table
- AS300 PGI - Cast iron internal gear pumps for SSP servopumps- technical table
- AS350 PGIL - Aluminium internal gear pumps for SSP servopumps - technical table
- AS400 PMM – Electric motors for SSP servopumps - technical table
- AS500 D-MP – Digital electronic drives for SSP servopumps - technical table
- AS800 Programming tools for pumps & servopumps – technical table
- AS810 Accessories for SSP servopumps - technical table
- AS910 Operating and maintenance information for SSP servopumps - technical table
- GS510 Fieldbus features

Other standards:

- CiA DS 301 v4.2.0 CANopen – Application Layer and Communication Profile for Industrial Systems
- CiA DR 303-1 v1.7 Cabling and connector pin assignment
- CiA DR 303-3 v1.4 Indicator specification

1.3 Trademarks

1.4 Abbreviations

Abbreviation	Description
CAL	CAN Application Layer
CAN	Controller Area Network
CiA	CAN in Automation
COB	Communication Object
COB-ID	COB-identifier
CRC	Cyclic Redundance Check
CTRL	Control Field
D	Derivative
Dcfg	Derivative Configuration
DR	Draft Recommendation
DRP	Draft Recommendation Proposal
DS	Draft Standard
DSP	Draft Standard Proposal
EMC	ElectroMagnetic Compatibility
EMCY	Emergency
EPROM	Eresable Programmable Read Only Memory
EOM	End of Message
ESD	ElectroStatic Discharge
FCS	Frame Check Sequence
FF	Feed Forward
HMI	Human Machine Interface
I	Integral
IEC	International Electrotechnical Commision
ISO	International Standard Organization
[L]	List parameters indication
L	Load
LLC	Logical Link Control
LSB	Least Significant Byte
LSS	Layer Setting Services
LVL	Level
MAC	Medium Access Control
MB	Memory Byte
MSB	Most Significant Byte
NMT	Network Managment
OSI	Open Systems Interconnection
P	Proportional
PDO	Process Data Object
PWM	Pulse Width Modulation
Res	Reserved
RO	Read Only
RPDO	Receive Process Data Object
RTR	Remote Transmission Request
SDO	Service Data Object
SOM	Start of Message
SYNC	Synchronization
TPDO	Transmit Service Data Object
USB	Universal Serial Bus

2 ABOUT CANBUS - CANOPEN FIELDBUS

In modern machines Industrial fieldbus systems sets the communication between electronic central unit, electromechanic and electrohydraulic servoactuators, transducers and all the electric/electronic accessories of the application.

As for other Industrial fieldbus systems, the use of CANbus-CANopen interface on the integral digital drive introduces the following advantages:

- **Lower installation costs** standard 2-wires connection allows drastic cost reduction in comparison to the conventional ”one to one” wiring of standard analog components.
- **Improved Safety** an elevated immunity to the electromagnetic interferences is performed due to the small number of the electric connections and the galvanic insulation (by optoisolators) between the fieldbus and the power devices.
- **Improved expandability** the adding of new components in fieldbus network requires only wiring to the bus and software configuring - no change on the control panel and no addition of cables on the machine is required.
- **Standardization** all the connected devices talk with the control unit “speaking the same language”: devices of different builders with the same function are easily interchangeable.

2.1 CANbus

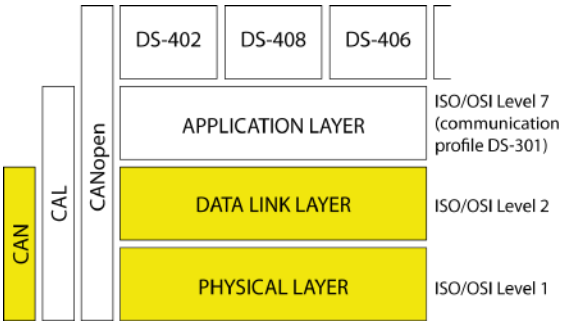
CANbus is a serial high-speed communication interface that was originally designed for the automotive industry and has been then applied with success also in the industrial field.

CANbus standard includes the definitions of:

‘Physical Layer’ (ISO/OSI communication lev.1)

‘Data Link Layer’ (ISO/OSI communication lev.2)

See 3 and DS102 standard specification.



CANbus provides an intrinsic system management of errors and collision detection of the communication on the net providing a great reliability in the transmission of the signals also in presence of strong electrical noises.

CANbus is defined according to EN50325-4 “Industrial communication subsystem based on ISO11898 for drive -device interfaces” – refer also to DS102 specification.

2.2 CANopen

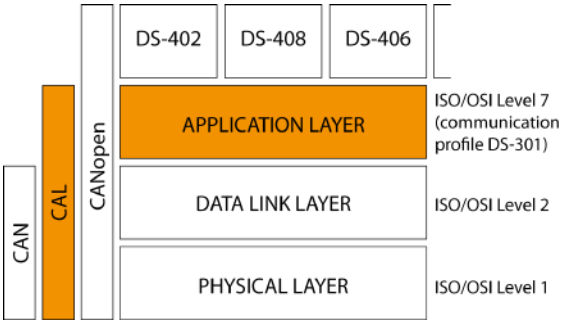
CANopen is the definition of all the services and objects available for the communication between devices connected to the fieldbus.

CANopen standard includes the definitions of:

'Application Layer' (ISO/OSI communication lev.7)

'Application Layer Setting' (auxiliary level)

See DS301 and DSP305 standard specifications.



In CANopen network, all connected devices (nodes) are equal so that they can listen or to actively access the bus communication; devices use codes to determine whether a message is relevant for them or not.

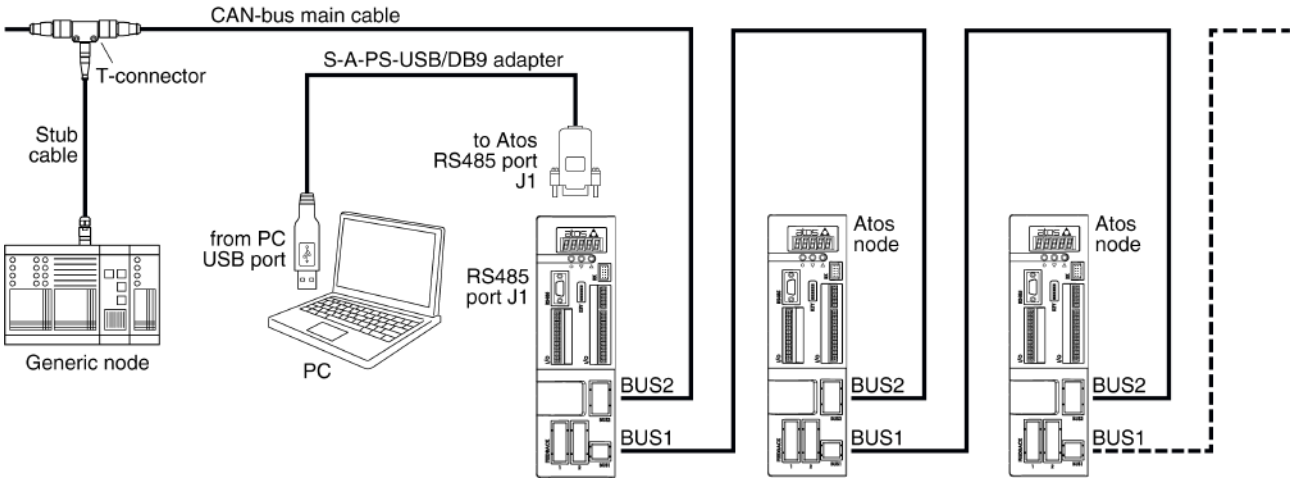
3 CANBUS - PHYSICAL LAYER

CANbus physical layer defines all the relevant aspects data signals transmission between devices connected to the network (always refer to DS102 standard specification).

3.1 Topology

CAN-Bus network has the structure of linear bus, composed by a main cable (“Trunk”) with several stations (“Nodes”) and passive terminator at both ends. Atos recommends, like CAN-Bus network topology, the classic daisy chain. In daisy chain topology the CAN-Bus slave (drive) has an IN and an OUT connector. The CAN-Bus cable (coming from the direction of the master) is plugged into the IN connector. The OUT connector is connected to the next station.

For fieldbus versions, the software permits drive's parameterization through serial RS485 communication port also if the drive is connected to the central machine unit via fieldbus.



Tree-structures are not permitted.

Max Nodes up to 127.

Depending on the number of stations connected, the bus level can drop so far that not even the minimum signal-to-noise ratio required for safe data transmission is maintained, in these cases specific signal are required.

Passive terminator resistors (120Ω) are required at both ends of the “Trunk” to avoid transmission errors (signal reflections) during data exchange.

Too many bus terminators can generate problems, since each connection presents an electrical load to the bus and thus consumes drive power.

When using line repeaters the terminator must be installed for each line segment.

3.2 Cables

According to ISO11898 a shielded twisted pair cable must be used for CANbus network: the best choice of the cable depends on many factors e.g. node number, max. transmission baud rate, line length, etc.

For example:

Bus length [m]	Length-related Resistance [mΩ/m]	Cross-section [mm2]
0 ... 40	70	0.25 ... 0.34
40 ... 300	<60	0.34 ... 0.6
300 ... 600	<40	0.5 ... 0.6
600 ... 1000	<26	0.75 ... 0.8

Maximum cable length dependents on selected transmission rate:

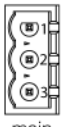
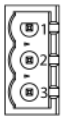
Transmission rate [kBit/s]	max. cable length: [m]
10	5000
20	2500
50	1000
125	500
250	200
500	100
1000	30

Cable length includes the total of trunk cable + all stub line lengths.

The use of repeaters may be required for bus lengths greater than 1 km.

3.3 Communication connectors

For BC executions (CANopen) two fieldbus communication connectors are always available for digital drive. To connect the drive into the CANopen fieldbus network use dedicated fast plug-in connectors.

CONNECTOR	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
BUS2  main	1	**CAN_H**	Bus line (high)	
	2	**CAN_L**	Bus line (low)	
	3	**CAN_GND**	Signal zero data line	
BUS1 	1	**CAN_H**	Bus line (high)	
	2	**CAN_L**	Bus line (low)	
	3	**CAN_GND**	Signal zero data line	

Note: on the board are present two dip-switch; one allows to terminate the fieldbus network while the other allows the simultaneous use of both connectors as input and output. For more information about setting dip-switch, please refer user manual.

4 CANOPEN CONFIGURATION

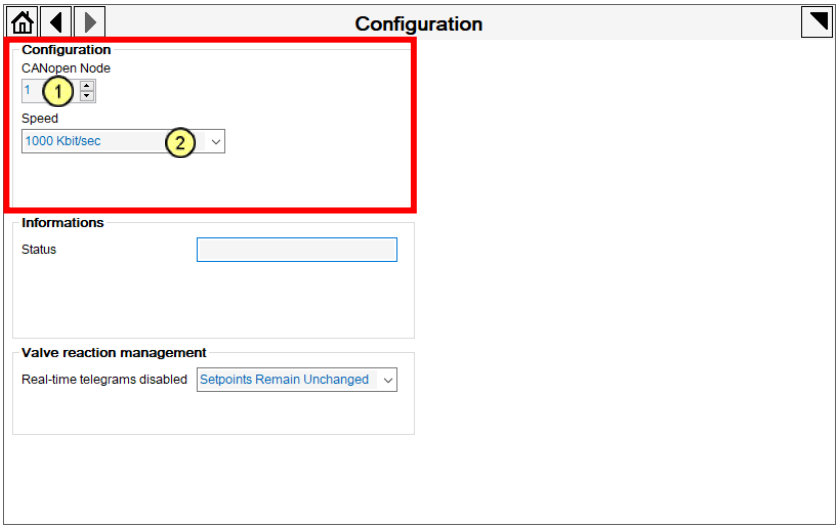
4.1 Node configuration

The drive configuration as CAN node includes the use of the following customer parameters (of conventional use):

Name	Description	Min	Max	Default
ID_CANOPEN	(200Dh- sub A2h) CAN BUS node ID	1	127	1
CANOPEN_BAUD_SEL	(200Eh-sub 30h)- CAN Baud rate	Range		0
		0	1 M	
		1		
		2	500 k	
		3	250 k	
		4	125 k	
		5	50 k	
		6	20 k	
		7	10 k	

These parameters must be rightly configured and saved in the permanent memory of the drive (201Eh sub 1Bh = 2). At start up these data are considered and become operating.

Image below is referred at the “Network management > Configuration” S-SW-SETUP software page.



CANopen Node

The control (1) allows to set the unique drive identification into the fieldbus (see S-MAN-SW).

Min	1
Max	127
Default	*1*

Use ‘Store User’ parameter button to save the new Node into the drive permanent parameters: new node will be applied at the next drive power-on (add only one drive at a time in the network, because two devices can not coexist on the network using the same node address). The ‘CANopen Node’ is not downloaded by setting files.

Update S-SW-SETUP configuration before reconnecting the drive.

Speed

The control (2) allow to set the drive communication speed (see S-MAN-SW).

Use 'Store User' button to save the new speed into the drive permanent parameters: new speed will be applied at the next drive power-on (switch-off the drive only when other connected component have been set to the same speed).

Update S-SW-SETUP configuration before re-connect the drive.

BC drives speed

option1	10 Kbit/sec
option2	20 Kbit/sec
option3	50 Kbit/sec
option4	125 Kbit/sec
option5	250 Kbit/sec
option6	500 Kbit/sec
option7	1000 Kbit/sec
Default	*50 Kbit/sec*

4.2 Communication objects configuration

The configuration of the communication objects CAN OPEN DS301 can uniquely be done via CAN. At first switch on, the drive is a non-configured node which satisfies the "pre defined connection set" for the identifiers allocation.

The following objects are available:

rx SDO with COB-ID = 600h + ID CAN node (parameter 200Dh subA2h)

tx SDO with COB-ID = 580h + ID CAN node

an emergency object with COB-ID = 80h + ID CAN node

NMT objects (Network Management):

in broadcast (COB-ID=0) for Module Control services

and COB-ID = 700h + ID CAN node for Error Control

The SYNC object in broadcast with COB-ID = 80h

With the SDO available, the drive can be totally configured as CAN node and only after the communication objects can be saved in the permanent memory using the proper command "store parameters" (1010h)" on the Sub-Index 2.

Also the object "restore default parameters (1011h)" Sub-Index 2 is managed to load all the default communication objects and to save them automatically in the permanent memory (switch off and then on the drive to make objects operating).

5 CANOPEN SERVICES

5.1 Service Data Object (SDO)

SDO are used to access the objects dictionary. A maximum of 4 server SDO can be available which can be configured with the following objects:

1200h	1st	server SDO parameter
1201h	2nd	server SDO parameter
1202h	3rd	server SDO parameter
1203h	4th	server SDO parameter

The transfer mode depends on the length of the data to be transferred : up to 4byte data length, the modality expedited is used as it is simple and immediate; for bigger size objects the modality segmented and block are both supported.

See the specific Communication Profile DS301 for having details on the different transmission modes; hereinafter are written only some peculiarities of our implementation:

- a writing access to SDO must indicate the number of significant byte (data set size)
- the writing data by SDO is liable to the same rules (drive state, keys, tolerated range…) seen for the other modalities of parameters modify (serial and keyboard)
- if SDO are structured in more segments, the drive will start writing the data at the indicated address with the first segment, without using a temporary buffer
- a controller is intended to avoid that two SDOs access the same object at the same time
- with the transmission in block modality, the computation of CRC and the “Protocol Switch Threshold” are not supported
- it is possible to set the block size of the SDO Block Download service at the address 2000h of the objects dictionary, in the manufacturer specific section

5.2 Process Data Object (PDO)

5.2.1 Received Process Data Object (RPDO)

A maximum of 4 RPDO can be configured with the following objects:

1400h 1st Receive PDO Communication parameter

1401h 2nd Receive PDO Communication parameter

1402h 3rd Receive PDO Communication parameter

1403h 4th Receive PDO Communication parameter

The first 2 Sub-Index related to each RPDO are managed: in this way it is possible to set the transmission type:

Transmission type	PDO receiving
0-240	Synchronous: when the following SYNC is received, the values received on the RPDO will be activated
241-253	Reserved
254	Asynchronous: the values received in the RPDO are immediately activated

The RPDO mapping can be dynamically effectuated by rightly configuring the following communication objects:

1600h 1st Receive PDO Mapping parameter

1601h 2nd Receive PDO Mapping parameter

1602h 3rd Receive PDO Mapping parameter

1603h 4th Receive PDO Mapping parameter

RPDO mapping must be executed by following the next directives as well: Set the number of mapped objects in Sub-Index 0 to be equal to zero Configure the addresses of all mapped objects.

Indicate the correct number of mapped objects in Sub-Index 0.

5.2.2 RPDO mapping

Parameter	Index	SubIndex	Data Type
Control Word 32bit	2EA0	00 h	UNSIGNED32
Flow Setpoint Fieldbus	2EA1	00 h	INTEGER32
Pressure Setpoint Fieldbus	2EA2	00 h	INTEGER32

5.2.3 Transmit Process Data Object (TPDO)

Up to a maximum of 4 TPDO can be configured with the following objects:

1800h 1st Transmit PDO Communication parameter

1801h 2nd Transmit PDO Communication parameter

1802h 3rd Transmit PDO Communication parameter

1803h 4th Transmit PDO Communication parameter

The 5 Sub-Index related to every type of TPDO are all managed: it is possible to set the transmission type (see the following table), the inhibit time with 100µs resolution and the period of the event timer with 1ms resolution.

Transmission type	PDO transmission
0	Acyclic synchronous: data are transmitted every SYNC received only if its value is changed from previous message
1-240	Synchronous and cyclical: the number indicates how many SYNC are in between two following transmissions
241-251	Reserved
252	Data are refreshed and sent at the following RTR when the SYNC is received
253	Data are refreshed and sent when the RTR is received (remote transmission request)
254	Event timer: cyclical transmission with a period time settable in ms in the Sub- Index 5
255	Manufacturer specific: it is settable time by time

Note: in the transmission type 255, it is possible to choose on which event the TPDO transmission works. The event choice can be effectuated only during the compiling the software code.

The TPDO mapping can be dynamically effectuated by rightly configuring the following communication objects:

1A00h 1st Transmit PDO Mapping parameter

1A01h 2nd Transmit PDO Mapping parameter

1A02h 3rd Transmit PDO Mapping parameter

1A03h 4th Transmit PDO Mapping parameter

The PDO mapping must be done by following these instructions:

1. the number of the mapped objects in Sub-Index 0 must be equal to zero
2. the addresses of all mapped objects must be configured
3. the correct number of mapped objects in the Sub-Index 0 must be indicated

5.2.4 TPDO mapping

Parameter	Index	SubIndex	Data Type
Flow Setpoint Analog	2EB0	00 h	INTEGER32
Flow Demand	2EB3	00 h	INTEGER32
Speed Actual	2EB4	00 h	INTEGER32
Speed Error	2EB5	00 h	INTEGER32
Pressure Setpoint Analog	2EB6	00 h	INTEGER32
Pressure Demand	2EB9	00 h	INTEGER32
Pressure Actual	2EBA	00 h	INTEGER32
Pressure Error	2EBB	00 h	INTEGER32
Pressure PID Feed Forward	2EBC	00 h	INTEGER16
Pressure PID Proportional	2EBD	00 h	INTEGER16
Pressure PID Integral	2EBE	00 h	INTEGER16
Pressure PID Derivative	2EBF	00 h	INTEGER16
Pressure PID Output	2EC0	00 h	INTEGER32
Speed Demand	2EC1	00 h	INTEGER32
Status Word 32bit	2EC2	00 h	UNSIGNED32
Q_INPUT Actual	2EC3	00 h	INTEGER32
P_INPUT Actual	2EC4	00 h	INTEGER32
TR1 Actual	2EC5	00 h	INTEGER32
Drive IGBT Temperature	2EC6	00 h	INTEGER16
Drive Radiator Temperature	2EC7	00 h	INTEGER16
Drive CPU Temperature	2EC8	00 h	INTEGER16
Motor Temperature	2EC9	00 h	INTEGER16
Drive DC Bus Voltage	2ECA	00 h	INTEGER16
Stator Voltage	2ECB	00 h	INTEGER16
Power Actual	2ECC	00 h	INTEGER16
Flux Current PID Output	2ECD	00 h	INTEGER16
Torque Current PID Output	2ECE	00 h	INTEGER16
Torque Current Demand	2ECF	00 h	INTEGER16
Torque Current Actual	2ED0	00 h	INTEGER16
Flux Current Demand	2ED1	00 h	INTEGER16
Flux Current Actual	2ED2	00 h	INTEGER16
Motor Total Current Actual	2ED3	00 h	INTEGER16

5.3 Emergency Object (EMCY)

The emergency object is transmitted by the drive when a new enabled alarm comes trough or when one or more alarms are reset. The Emergency telegram is made by 8 byte as shown in the following table:

Byte	0	1	2	3	4	5	6	7
Meaning	Emergency Error Code		Error register	Manufacturer specific alarms LSB –MSB				

In our implementation only two codes of the error code are implemented:

00xx = Error Reset or No Error

10xx = Generic Error

Speaking of the Error register (object 1001h), the following bits are managed corresponding to the following alarms:

Bit	Meaning	Corresponding alarms
0	General error	all
1	Current	A3
2	Voltage	A10 - A11 -A13
3	temperature	A5 - A6

In Manufacturer specific the bytes 3 and 4 are assigned with the state of the various alarms of the drive, and byte 5 is the alarm sub-code. Further 2 bytes for the transmission of possible other user's data are available.

The management of 1003h "pre-defined error field " object memorises the chronology of the alarm events (from start up of the drive) up to a maximum of 32 elements.

At every new alarm event 4 bytes are memorised, 2 are mandatory and correspond to the Error Code; the other 2 are Manufacturer specific and in our specific case correspond to the state of all the drive alarms.

Additional information		Error code
alarms MSB	alarms LSB	Error code MSB Error code LSB

EMCY configuration

Error Meaning	Code [hex]	Reg. [hex]
No Error	0000	01
Flow Analog setpoint out of limits	5231	00
Pressure Analog setpoint out of limits	5232	00
Pressure Transducer out of limits	5234	00
Pressure Control error	8302	00
Flow Control Error	8301	00
Pressure Limit touched	F090	01
Flow Limit touched	F090	02
Autotuning Procedure Not Completed	F044	00
Motor Check Procedure not executed	F091	00

5.4 Network Management Object (NMT)

This function allows the NMT master to check and set the state to every NMT slave.

All the services of Module Control and also the Node Guarding Protocol which uses the COB-ID = 700h + ID CAN node are implemented: this allows the slave to communicate that the bootup ended and the pre-operational modality is active, thus the master can interrogate the different slaves with an RTR.

The Life guarding function is implemented as well: the drive (NMT slave) can be set up by the objects:

100Ch **Guard time** in ms

100Dh **Life time factor** (multiplier factor)

their product yields the **Node life time**

Note: node life time is internally saturated in the period time of 32767/fpwm sec

100Ch **Guard time** in ms

100Dh **Life time factor** (multiplier factor)

} their product yields the **Node life time**
note: node life time is internally saturated in the period time of 32767/fpwm sec

Life guarding is enabled only if life time Node is different to zero; in this case the check-up starts after having received the first RTR from the NMT master.

The Communication profile DS301 doesn't decide which action it has to start if the time constrain of life guarding hasn't been respected. It's possible to decide how to act, during the firmware compilation step. By default, no action is done.

6 OBJECT DICTIONARY

6.1 Communication profile area

The following objects of the communication profile are supported:

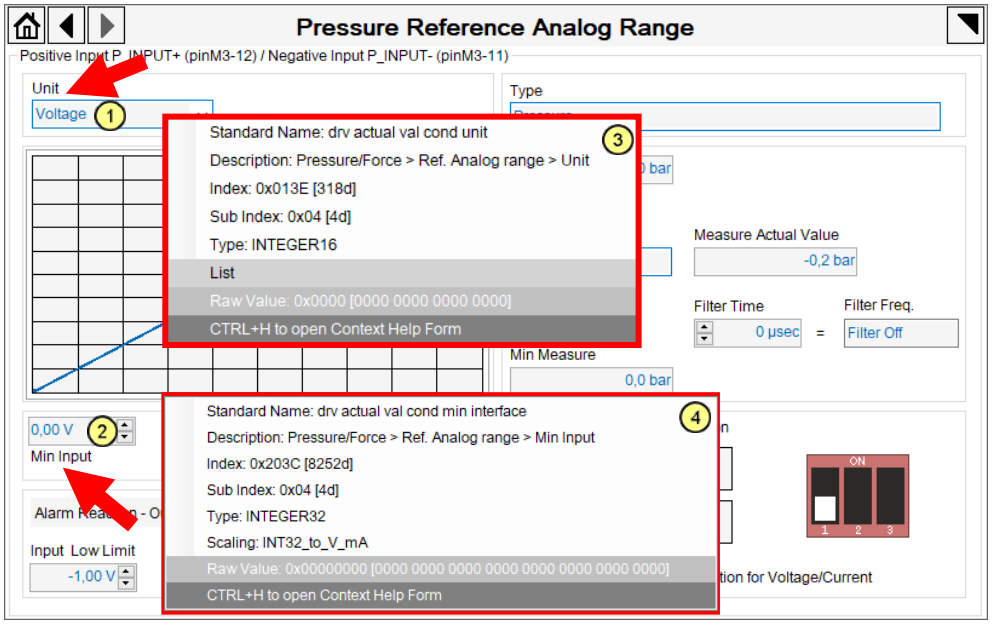
Index (hex)	Object	Name	Type	Access
1000	VAR	Device type	UNSIGNED32	Reading
1001	VAR	Error register	UNSIGNED8	Reading
1002	VAR	Manufacturer status register	UNSIGNED32	Reading
1003	ARRAY	Pre-defined error field	UNSIGNED32	Reading
1005	VAR	COB-ID SYNC	UNSIGNED32	Reading/writing
1006	VAR	Communication cycle period	UNSIGNED32	Reading/writing
1008	VAR	Manufacturer device name	Vis-String	constant
1009	VAR	Manufacturer hardware version	Vis-String	constant
100A	VAR	Manufacturer software version	Vis-String	constant
100C	VAR	Guard time	UNSIGNED16	Reading/writing
100D	VAR	Life time factor	UNSIGNED8	Reading/writing
1010	ARRAY	Store parameters	UNSIGNED32	Reading/writing
1011	ARRAY	Restore dafault parameters	UNSIGNED32	Reading/writing
1014	VAR	COB-ID EMCY	UNSIGNED32	Reading/writing
1015	VAR	Inhibit Time EMCY	UNSIGNED16	Reading/writing
1018	RECORD	Identity Object	Identity (23h)	Reading
1200	RECORD	1st Server SDO parameter	SDO parameter	Reading/writing
1201	RECORD	2nd Server SDO parameter	SDO parameter	Reading/writing
1202	RECORD	3rd Server SDO parameter	SDO parameter	Reading/writing
1203	RECORD	4th Server SDO parameter	SDO parameter	Reading/writing
1400	RECORD	1st receive PDO parameter	PDO CommPar	Reading/writing
1401	RECORD	2nd receive PDO parameter	PDO CommPar	Reading/writing
1402	RECORD	3rd receive PDO parameter	PDO CommPar	Reading/writing
1403	RECORD	4th receive PDO parameter	PDO CommPar	Reading/writing
1600	RECORD	1st receive PDO mapping	PDO Mapping	Reading/writing
1601	RECORD	2nd receive PDO mapping	PDO Mapping	Reading/writing
1602	RECORD	3rd receive PDO mapping	PDO Mapping	Reading/writing
1603	RECORD	4th receive PDO mapping	PDO Mapping	Reading/writing
1800	RECORD	1st transmit PDO parameter	PDO CommPar	Reading/writing
1801	RECORD	2nd receive PDO parameter	PDO CommPar	Reading/writing
1802	RECORD	3rd receive PDO parameter	PDO CommPar	Reading/writing
1803	RECORD	4th receive PDO parameter	PDO CommPar	Reading/writing
1A00	RECORD	1st transmit PDO mapping	PDO Mapping	Reading/writing
1A01	RECORD	2nd transmit PDO mapping	PDO Mapping	Reading/writing
1A02	RECORD	3rd transmit PDO mapping	PDO Mapping	Reading/writing
1A03	RECORD	4th transmit PDO mapping	PDO Mapping	Reading/writing

6.2 Manufacturer specific profile area

Directly from the graphical interface of the S-SW-SETUP software, it is possible to access information useful for the development of fieldbus communication by simply clicking with the mouse on a selected parameter or pressing CTRL+H on the PC keyboard.

Mouse click- example:

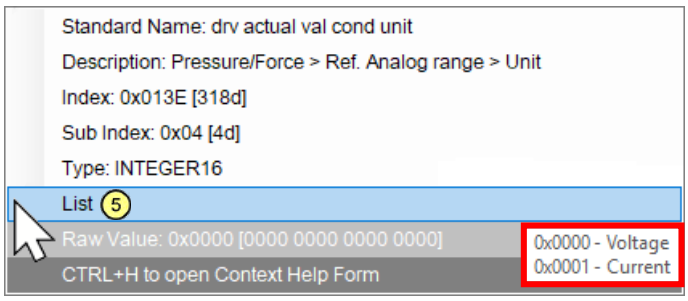
Click right button of the mouse on **Unit** control (1) or **Min Input** control (2) to open the related fieldbus communication windows ((3) and (4)).



Windows (3) and (4) shown all fieldbus information of selected parameter:

Standard Name:	Parameter name
Description:	Parameter fast reference to S-SW-SETUP software and drive manual descriptions
Index: Sub Index:	Parameter address
Type:	Parameter dimension and data type
Scaling:	Parameter scaling value (see 7 and 7.2)
List:	Parameter list value
Raw Values	Numeric parameter
CTRL+H	Press CRTL+H to open Context Help Form (see **CRTL+H - example**)

(1) Pass mouse arrow on **List** (5) to display the information



CRTL+H - example:

The information in Context Help Form window are the same as described above for the "mouse click - example".

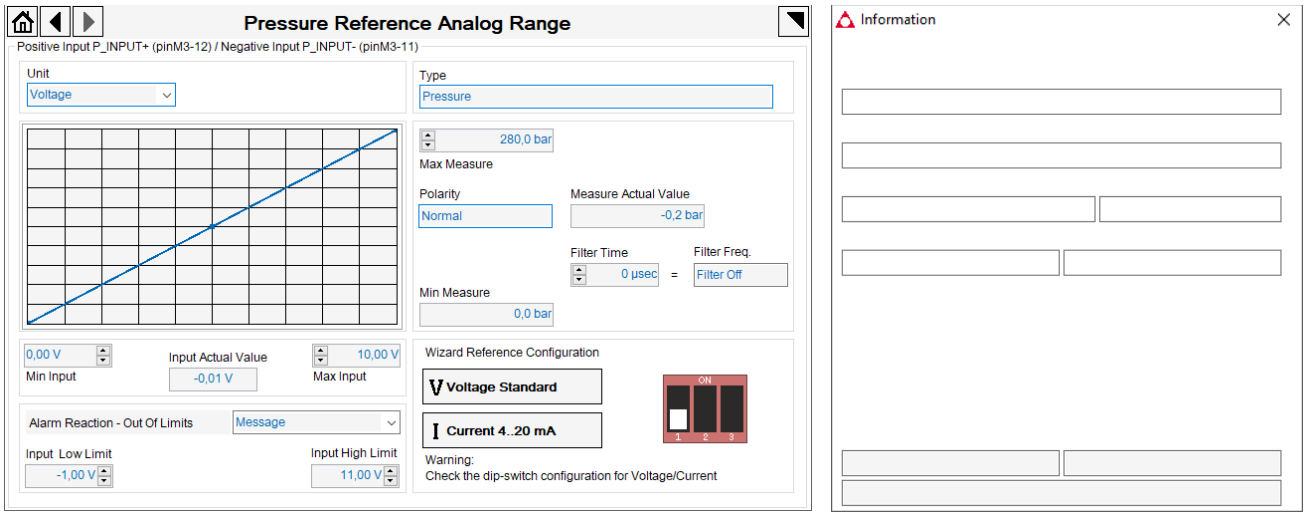
By pressing CRTL+H on PC keybord the Context Help Form windows opens.

Once the window has been opened with CTRL + H, it always remains active until it is closed by the user.

In this way it is possible to view the fieldbus information of each single parameter present on the software page, simply by positioning the mouse over it.

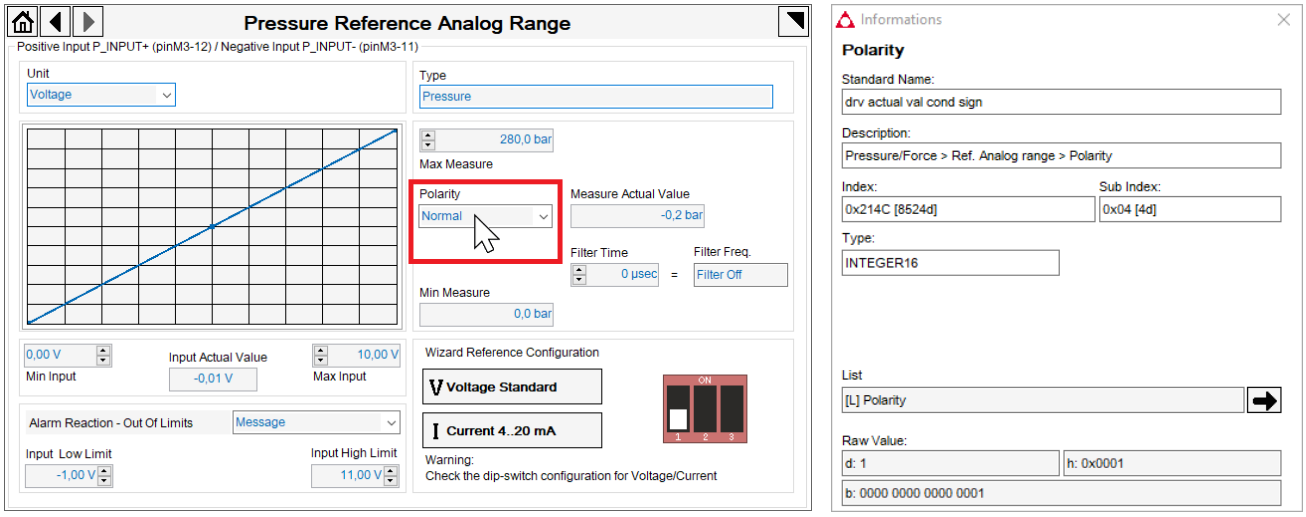
If no parameter is selected the fields of the window will be appears empty.

Example: no parameter selected



Pass the mouse on a parameter to display all fieldbus communication information related to it.

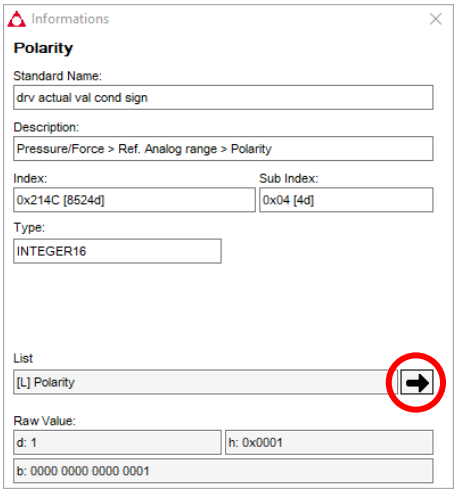
Example: “Polarity” parameter selected



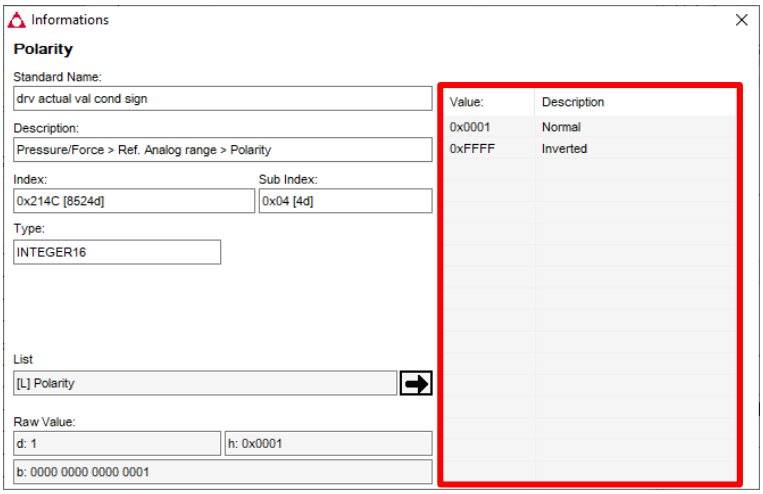
When in a parameter is present a “List” [L] press the black arrow to display the related information of the list (Value and Description).

Example: [L] Polarity

Press the black arrow



List information are displayed



7 SCALING DESCRIPTION

7.1 Internal resolution scaling

These scaling convert 'Raw' value with internal resolution formats in 'Real' value [Real Unit]:

Scale	Gain Raw to Real	Gain Real to Raw	Real Unit
Raw_mbar	1	1	mbar
Raw_mrpm	1	1	mrpm
Raw_µsec	1	1	µsec
Raw_mHz	1	1	mHz
Raw_msec	1	1	msec
Raw_mm	1	1	mm
INT16_to_A_X16	0,0625	16	A
INT16_to_V_X16	0,0625	16	V
INT16_to_°C_X16	0,0625	16	°C
INT16_to_kW_X16	0,0625	16	kW
INT16_to_Perc200	200 / 32767	32767 / 200	%
UINT16_msec_to_sec	0,001	1000	sec
INT32min_to_gg_hh_mm	1	1	min
INT16_to_V_mA	0,0001	10000	V
	0,0002	5000	mA
8192_to_200Perc	200 / 8192	8192 / 200	%

Real_Value [Real Unit] = Gain_Raw_to_Real ∗ Raw_Value

Raw_Value = Gain_Real _to_Raw ∗ Real_Value [Real Unit]

7.2 VALUE_to_Physical scaling

These scaling depend by the input interface. In the below table are described the input interface types:

Input interface	Scaling	Measure Unit
Pressure	RAW_mbar	mbar
Speed	RAW_mrpm	mrpm

7.3 Gain scaling

These scalings convert 32bits 'raw' values into a Gain factor with unit indication if required:

Scale	Real Full Scale	Real Unit
INT32_to_Gain	1	none

The function use the two words of value to calculate the gain real value:

Raw Value	**A_raw**: (Most Significant Word)	**B_raw**: (Less Significant Word)

where for Gain function:

Real_Gain = (A_raw / B_raw) ∗ Real_Fullscale

8 BITS PARAMETERS DESCRIPTIONS

8.1 Status Word - 32bit

Index	2EC2h	**SubIndex**	00h

Conditions:

MSB

Bit	**31-28**	**27**	**26**	**25**	**24**	**23-22**	**21-20**	**19-16**
Content	Res	**STO Test Suggested**	**STO Corrupted**	**STO Active**	**Pump Overheat Protection Active**	**Smart Selection**	**Pressure PID Selection**	Res

LSB

15	**14**	**13-12**	**11**	**10**	**9**	**8**	**7**	**6-0**
Drive Running	**Control Error**	Res	**Internal Limit Reached**	**Pressure Target Reached**	**Local**	**Power Limitation Active**	**Warning**	**Status**

Status

The first seven bits 6-0 indicate the functional status of the electronic drive:

Status value (bits 6-0)	
Not reready to switch on	0xx 0000
Switch on disable	1xx 0000
Ready to switch on	01x 0001
Switched on	01x 0011
Operation enabled	01x 0111
Quick stop active	00x 0111
Fault reaction active	0xx 1111
Fault	0xx 1000

Warning

Bit 7 indicates the presence of alarm or error conditions:

Warning (bit 7)	
Normal working	0
Error/Alarm present	1

Power Limitation Active

Bit 8 indicates if the control (Power Limitation Active) is active or is not active:

Power Limitation Active (bit 8)	
No active	0
Active	1

Local

Bit 9 indicates if the drive status is actually controlled by fieldbus (see 8.2 – control word) or not:

Local (bit 9)	
Local (internal) control	1
Remote (fieldbus) control	0

Pressure Target Reached

Bit 10 indicates when the actual regulated pressure has reached the demanded value:

Pressure target reached (bit 10)	
Not reached	0
Reached	1

Limit Touched

Bit 11 indicates when the demanded pressure value is out of limit:

Limit Touched (bit 11)	
Limit not touched	0
Limit touched	1

Control Error

Bit 14 indicates when a pressure error is present:

Control Error (bit 14)	
Normal working	0
Control error present	1

Drive running

Bit 15 indicates when the drive is running:

Drive running (bit 15)	
Drive stop	0
Drive running	1

Pressure PID Selection

Bits 21-20 indicate which PID parameters set is active for pressure control:

Pressure PID selection (bits 21-20)	
PID1	00
PID2	01
PID3	10
PID4	11

Smart Selection

Bits 23-22 indicate which smart parameters set is active for smart control:

Pressure PID selection (bits 21-20)	
Dynamic	00
Balanced	01
Smooth	10

Pump Overheat protection active

Bit 24 indicates if the control (Pump Overheath protection) is active or is not active:

Pump Overheat protection active (bit 24)	
No active	0
Active	1

STO active

Bit 25 indicates if the STO function is active or is not active:

STO active (bit 24)	
No active	0
Active	1

STO corrupted

Bit 26 indicates if the STO function is corrupted or is no corrupted:

STO corrupted (bit 26)	
No corrupted	0
Corrupted	1

STO test suggested

Bit 27 indicates if the STO function is corrupted or is ok:

STO test suggested (bit 27)	
No test suggested	0
Test suggested	1

8.2 Control Word - 32bit

Index	2EA0h	**SubIndex**	00h

Conditions:

MSB *LSB*

Bit	**31-16**	**15-14**	**13-12**	**11**	**10-8**	**7-0**
Content	Res	**Smart Selection**	**Pressure PID Selection**	**Pressure Control Enable**	Res	**Control**

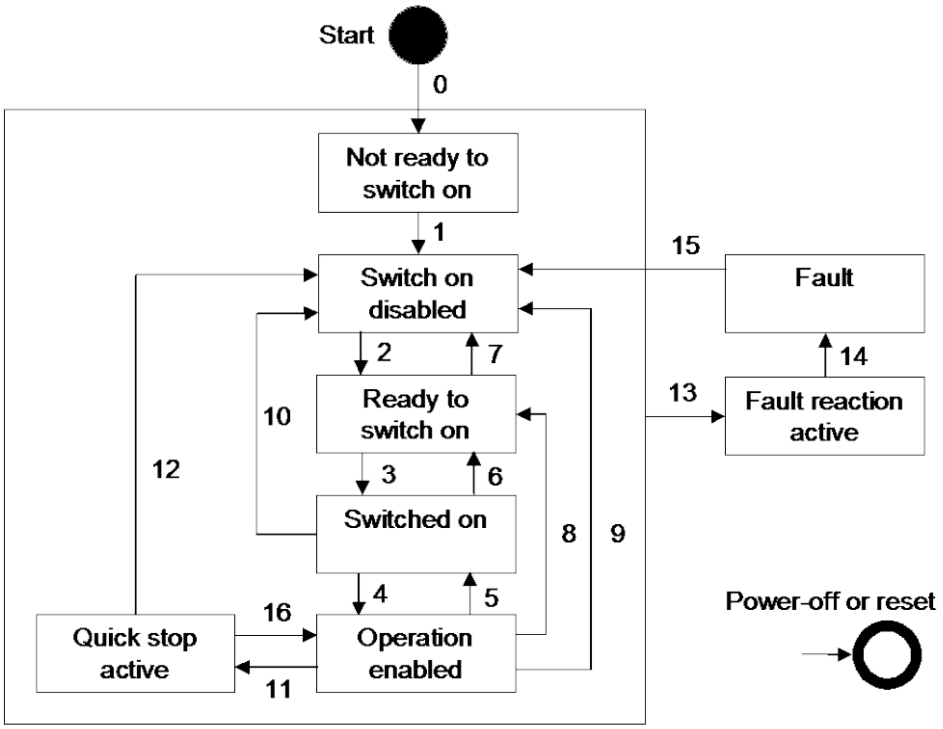
Control

The first eight bits 7-0 allow to request the transition of the drive status to a defined condition:

Command	**Control Word Bits**					**Transition**
	Bit 7	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**	
Shutdown	0	X	1	1	0	2 , 6 , 8
Switch on	0	0	1	1	1	3
Switch on + enable operation	0	1	1	1	1	3 + 4 **(*)**
Disable voltage	0	X	X	0	X	7 , 9 , 10 , 12
Quick stop	0	X	0	1	X	7 , 10 , 11
Disable operation	0	0	1	1	1	5
Enable operation	0	1	1	1	1	4 , 16
Fault reset		X	X	X	X	15

(*) Automatic transition to enable operation state after executing switched on state functionality

Note: bits 6, 5, 4 of the controlword are not used.



Pressure Control Enable

Bit 11 allows to select the Enable when the alternated control is active:

Pressure Control Enable (bit 11)	
Speed control active	0
Alternated control active	1

Pressure PID Selection

Bits 13-12 allows to select the active Pressure PID parameters set:

Pressure PID selection (bits 13-12)	
PID1	00
PID2	01
PID3	10
PID4	11

Smart Selection

Bits 15-14 indicate which smart parameters set is active for smart control:

Pressure PID selection (bits 15-14)	
Dynamic	00
Balanced	01
Smooth	10

9 CONFIGURATION FILE (EDS)

An electronic description of Atos drives CANopen characteristics is available through EDS (Electronic Data Sheet) files configuration. These files, included in MyAtos, list the communication features and the accessible parameters thus allowing to speed up configuration process of fieldbus master devices.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