

# **S-MAN-S-EP**

---

SMART SERVOPUMP SYSTEM  
PROGRAMMING INSTRUCTIONS  
PROFINET RT/IRT PROTOCOL



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# 1 GENERAL

## 1.1 About this user manual


This manual describes the required information to operate Atos Smart Servopump system (SSP) using PROFINET 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 PROFINET communication.

The purpose of this manual is not to cover all the details or variations of PROFINET 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](mailto: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 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

### 1.3 Trademarks

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## 1.4 Abbreviations

Abbreviation	Description
API	Application Process Instance
AR	Application Relation
ADU	Application Data Unit
CR	Communication Relation
CC-A	Conformance Class A
CC-B	Conformance Class B
CC-C	Conformance Class C
DCP	Discovery and Basic Configuration Protocol
DHCP	Dynamic Host Configuration Protocol
EDS	Electronic Data Sheet
EMC	ElectroMagnetic Compatibility
ESD	ElectroStatic Discharge
FTP	File Transfer Protocol
GSD	General Station Description
GSDML	GSD Markup Language
HICP	Anybus IP config protocol
HMI	Human Machine Interface
I&M	Identification & Maintenance
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standard Organization
IP	Internet Protocol
IRT	Isochronous Real Time
LAN	Local Area Network
MAC	Medium Access Control
MRP	Media Redundancy Protocol
NMT	Network Management
PNIO	ProfiNet Input Output
PROFINET	Process Field Network
RT	Real Time
SNMP	Simple Network Management Protocol
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
USB	Universal Serial Bus

## 2 ABOUT PROFINET IO RT/IRT INTERFACE - ETHERNET FIELDBUS

PROFINET IO (Input - Output) enables the connection of decentralized field devices, such as I/Os, drives, transducers or analysis devices to a central automation device, such as a PLC, PC or process control system. It can be considered as the direct successor of PROFIBUS DP.

Data transfer is based on the Fast Ethernet standard transmission with 100 Mbit/s.

PROFINET IO follows the provider-consumer model for the data exchange.

Every PROFINET Device has a defined set of features which are mandatory based on its conformance class. The conformance classes are divided into three categories:

### Conformance Class A (CC-A)

Is the most basic and provides basic functions for PROFINET IO with RT communication provides real time and acyclic real time, as well as support for standard TCP/IP and basic functions such as topology information.

### Conformance Class B (CC-B)

Adds in simple network management protocol (SNMP) support to make it possible to read statistics with standard SNMP tools.

### Conformance Class C (CC-C)

Is the most advanced and it should be noted that they build upon each other, so Class C also contains all functions from Class B and A. Conformance Class C has support for motion control applications with a jitter of less than a microsecond and distributed clock synchronization protocol (allowing deterministic Ethernet) based on hardware-supported bandwidth reservation and synchronization (IRT communication). Conformance Class C is the basis for isochronous applications.

	CC-A	CC-B	CC-C
Real-Time Data Exchange - cycle times down to 1ms	●	●	●
Alarm and Diagnostic	●	●	●
Network Topology Support	●	●	●
SNMP Support		●	●
Real-Time Data Exchange - cycle times down to 31.25us			●

The PROFINET IO connection can be configured for both acyclic and cyclic I/O data:

### Acyclic Data

Are sent only when it is needed. It is useful for non time critical parameters , or for very large data transfers. For example, when you need to send or read some setting parameter from the PLC that doesn't need any type of time synchronization behaviour.

### Cyclic Data

Are defined to as "I/O" and are time-critical are used for real-time data exchange (speed and low latency are important) Cyclic I/O data is always sent between the PLC and I/O device at the specified update time. For example, status information from the Atos IO Device, would typically be part of the cyclic data. Cyclic I/O data is defined by the Incoming (Input) and Outgoing (Output) Cyclic I/O Data.

### 3 ETHERNET - PHYSICAL LAYER

Ethernet physical layer defines all the relevant aspects data signals transmission between devices connected to the network.

#### 3.1 PROFINET Network

Following a short description of the terms used in a PROFINET network, into this guide:

**IO Controller:** master (e.g. PLC) or controlling device (e.g. HMI) that initiates implicit communication with IO devices.

**IO Device:** device that receives a connection request to PROFINET network. One or more IO Devices can be connected to the IO Controller on a PROFINET network, also through Ethernet switches (see 3.1.1). IO Devices are also an explicit messages server.



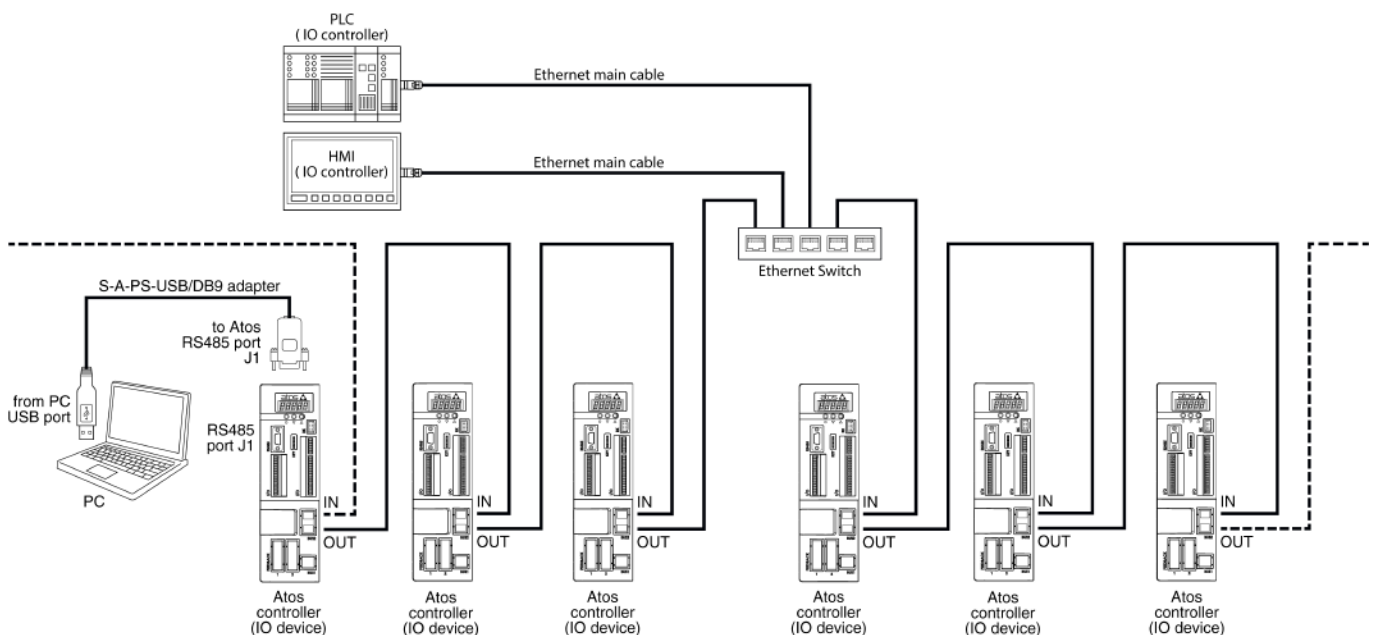
The Atos drives are IO Devices.

##### 3.1.1 Wiring PROFINET Network

Atos recommends, like PROFINET network topology, the classic daisy chain. Atos IO Devices are supplied with RJ-45 socket communication connectors (see 3.3) to manage two integrated Ethernet ports: this feature allows to use the two ports on the device interchangeably. Connect one port of the Atos IO Device to an port on the IO Controller (e.g. PLC or HMI) or to one port of Ethernet Switch as showed below.



Network configuration is for the most part performed automatically by the IO Controller (e.g. PLC). Please refer the PLC user guide for complete information on network configuration.



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.

### 3.2 Cables

To connect the PROFINET devices only use cables that meet the Ethernet specifications.


Ethernet patch or crossover cables in CAT5e quality can be used as the connection cable. CAT5e is an Ethernet network cable standard defined by the EIA/TIA. CAT5e is the fifth generation of twisted pair Ethernet technology and the most popular of all twisted pair cables in use today. CAT5e cable runs are limited to a maximum recommended run length of 100m.

Also Atos recommends shielded cables for environments where proximity to power cable, high power or RF equipments may introduce crosstalk.

Type	Signal	Distance between 2 nodes	Category
Ethernet on	100 BASE-TX Transformer Coupling	0,2 - 100 m	CAT5 or greater

### 3.3 Communication connectors

For EP (PROFINET) executions two fieldbus communication connectors are always available for digital drive. To connect the drive into the Ethernet network use dedicated RJ45 – 8 pin connectors.


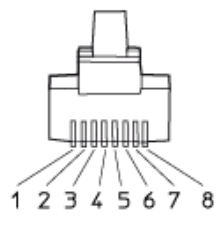







CONNECTOR	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
 <b>BUS2</b> IN OUT	1	<b>TX+</b>	Transmitter (white/orange)	
	2	<b>RX+</b>	Receiver (orange)	
	3	<b>TX-</b>	Transmitter (white/green)	
	4	<b>NC</b>	-	Do not connect
	5	<b>NC</b>	-	Do not connect
	6	<b>RX-</b>	Receiver (green)	
	7	<b>NC</b>	-	Do not connect
	8	<b>NC</b>	-	Do not connect

**Note:** perform the cables connection following the IN and OUT indications

#### Connector to PROFINET network (RJ45 – 8 poles - male)

The PROFINET module incorporates two 10/100 Base TX RJ45 interfaces. The individual contacts of the RJ-45 socket are allocated as per the "T 568-B" standard. In table below are shown the pins and the colour codes of the T 568-B standard.

#### PROFINET Input/Output drive connectors (RJ45 – 8 poles - female)

PIN	SIGNAL	COLOR (may change depending on cable)	TECHNICAL SPECIFICATIONS		RJ45 T 568-B
1	<b>TX+</b>	white/orange 	Transmitter+	BI_DA+	
2	<b>TX-</b>	orange 	Transmitter-	BI_DA-	
3	<b>RX+</b>	white/green 	Receiver+	BI_DB+	
4		blue 	(do not connect)	BI_DC+	
5		white/blue 	(do not connect)	BI_DC-	
6	<b>RX-</b>	green 	Receiver-	BI_DB-	
7		white/brown 	(do not connect)	BI_DD+	
8		brown 	(do not connect)	BI_DD-	

## 4 PROFINET CONFIGURATION

The Atos drive is a modular PROFINET slave, classified as a generic I/O Device: this allow an extended compatibility with most PNIO controllers and require no specific device profile support.

Modular PROFINET devices have slots (MODULES) that can be populated with different kind of sub- slot (SUBMODULES) and so can be configured for different functions.

Specifically, the drive is defined as a RT and IRT capable device with 3 modules:

- MAIN module
- INPUTS module
- OUTPUTS module

The Main module contains 3 standard sub-modules for device I&M (Identification and Maintenance) with data and status about the device and link ports.

The Inputs module must be populated with 1 sub-module that can be choosed among a collection of different sized data INPUT, from 1 up to 10 words.

The Outputs module must be populated with 1 sub-module that can be choosed among a collection of different sized data OUTPUT, from 1 up to 10 words.

Input and Output are related to PNIO controller point of view, so input is data send by the slave to the master and output is data send by the master to the slave.

In order to accept CR (Communication Relation) for cyclic data drive requires that the size of input data matches the size of output data so Input and Output sub-modules have to be of same size. Also, the data size configured into the modules in PNIO controller configurator tool have to match to the size of data configured into drive by Cyclic Mapping.

PNIO controller network configuration tool allow also for setting the device name and IP address (by DCP services).

The PROFINET master uses device name and IP address to univocally identify the devices connected to the network and to establish AR (Application Relation) to them so the default name and IP address of drive have to be changed properly.

Please notice that while the device name assigned by master via DCP can be permanently stored by drive, the IP address will be over-written at next power-up or reset so the IP address assigned into the network configurator have to be also setted into drive configuration by S-SW-SETUP ( see IP Addressing configuration )

## 4.1 IP Addressing configuration

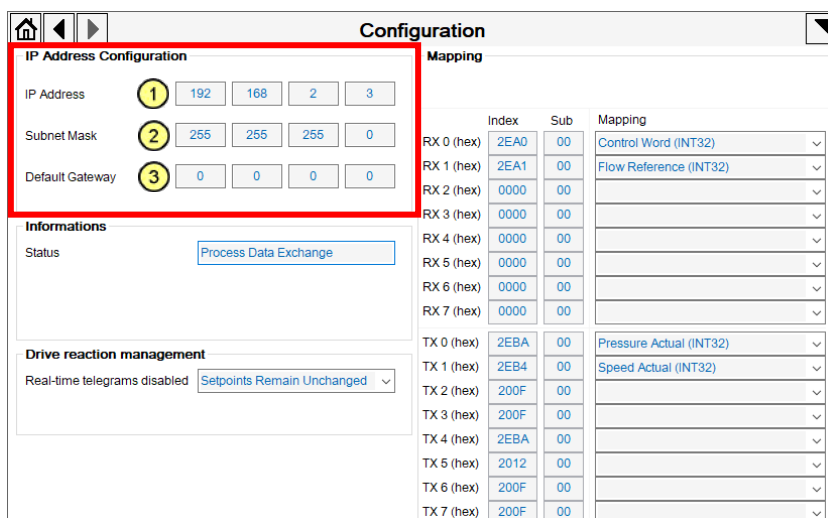
IP Address, Subnet Mask and Default Gateway are assigned by fieldbus master (e.g. Discovery and Configuration Protocol) and are used by the drive for communication. The IP address must be set univocally in the network in order to allow proper communication. The subnet mask and gateway allow identification of local sub-network boundaries and specify a path to reach outside hosts.

PNIO controller (PROFINET master) usually can set the device name, IP address, subnet mask and gateway of PNIO devices (PROFINET slaves) by DCP services.

Although all these can be temporary changed by the master via DCP, only the device name can be permanent stored by the drive: at power-up all other settings are over-written with the values saved into drive parameters.



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



Index	Sub	Mapping	
RX 0 (hex)	2EA0	00	Control Word (INT32)
RX 1 (hex)	2EA1	00	Flow Reference (INT32)
RX 2 (hex)	0000	00	
RX 3 (hex)	0000	00	
RX 4 (hex)	0000	00	
RX 5 (hex)	0000	00	
RX 6 (hex)	0000	00	
RX 7 (hex)	0000	00	
TX 0 (hex)	2EBA	00	Pressure Actual (INT32)
TX 1 (hex)	2EB4	00	Speed Actual (INT32)
TX 2 (hex)	200F	00	
TX 3 (hex)	200F	00	
TX 4 (hex)	2EBA	00	
TX 5 (hex)	2012	00	
TX 6 (hex)	200F	00	
TX 7 (hex)	200F	00	

### IP Address Configuration

IP Address ①, Subnet Mask ② and Default Gateway ③ are assigned by fieldbus master (e.g. Discovery and Configuration Protocol) or IPconfig. Network configuration parameters can be modified with values between: 0.0.0.0 - 255.255.255.255.



IPconfig is a software directly provided by Atos that allows to identify only PROFINET Atos IO Device: it can be downloaded from My Atos.



Atos IO device are supplied by factory default with an unique MAC Address (shown on Atos device label). This allows to communicate with the Atos IO device in order to configure the IP address for the network.

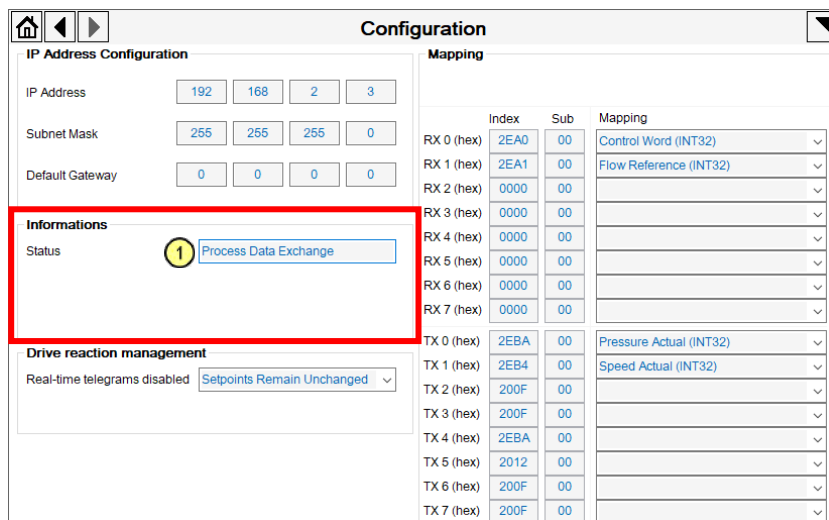
## 4.2 Fieldbus status

This read-only parameter monitor the state of fieldbus interface:

Setup	Fieldbus setup in Progress
Init	Fieldbus interface in Initialization
Wait Process Data	AR/CR with PNIO controller (Profinet Master ) are ON, but no cyclic data are exchanging
No Connection	The network is idle. This happens if there are no connection or if no Profinet Master has established an AR/CR with the drive
Process Data Exchange	AR/CR with PNIO controller (Profinet Master ) are ON and cyclic data are exchanging
Error	Fieldbus Error
Exception	Fatal Error on the PROFINET Module



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



**Configuration**

**IP Address Configuration**

IP Address: 192 168 2 3

Subnet Mask: 255 255 255 0

Default Gateway: 0 0 0 0

**Informations**

Status: 1 Process Data Exchange

**Drive reaction management**

Real-time telegrams disabled: Setpoints Remain Unchanged

**Mapping**

	Index	Sub	Mapping
RX 0 (hex)	2EA0	00	Control Word (INT32)
RX 1 (hex)	2EA1	00	Flow Reference (INT32)
RX 2 (hex)	0000	00	
RX 3 (hex)	0000	00	
RX 4 (hex)	0000	00	
RX 5 (hex)	0000	00	
RX 6 (hex)	0000	00	
RX 7 (hex)	0000	00	
TX 0 (hex)	2EBA	00	Pressure Actual (INT32)
TX 1 (hex)	2EB4	00	Speed Actual (INT32)
TX 2 (hex)	200F	00	
TX 3 (hex)	200F	00	
TX 4 (hex)	2EBA	00	
TX 5 (hex)	2012	00	
TX 6 (hex)	200F	00	
TX 7 (hex)	200F	00	

### Informations - Status

The indicator 1 allows to display the status of the fieldbus communication.

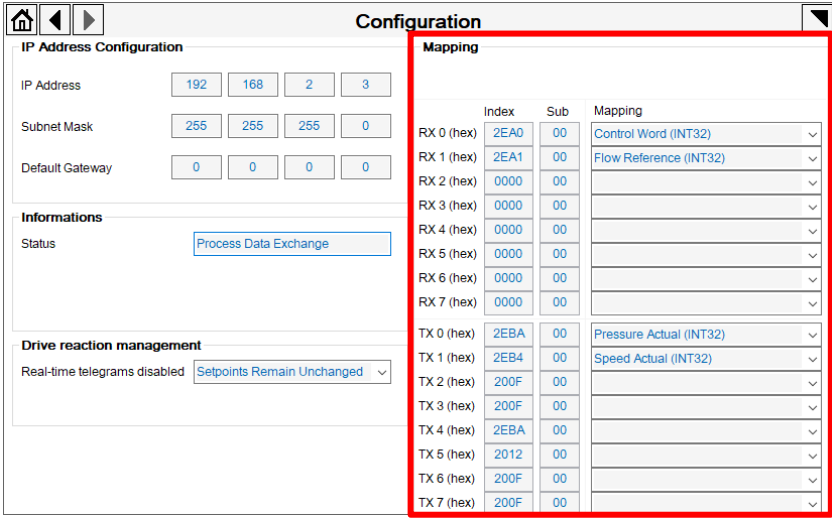
## 5 PROFINET SERVICES

### 5.1 Cyclic Communication

Cyclic communication consists of few data (maximum 10 words for each direction) exchanged quickly and frequently (from some ms down to hundreds  $\mu$ s cycle): I/O, diagnostic, set point, internal values... the so called "PROCESS DATA".

#### 5.1.1 Mapping

It's possible to map the desired objects with S-SW-SETUP at the "Network management > Configuration" software page (see image below) that allow mapping up to 8 objects both in transmission and reception.



	Index	Sub	Mapping
RX 0 (hex)	2EA0	00	Control Word (INT32)
RX 1 (hex)	2EA1	00	Flow Reference (INT32)
RX 2 (hex)	0000	00	
RX 3 (hex)	0000	00	
RX 4 (hex)	0000	00	
RX 5 (hex)	0000	00	
RX 6 (hex)	0000	00	
RX 7 (hex)	0000	00	
TX 0 (hex)	2EBA	00	Pressure Actual (INT32)
TX 1 (hex)	2EB4	00	Speed Actual (INT32)
TX 2 (hex)	200F	00	
TX 3 (hex)	200F	00	
TX 4 (hex)	2EBA	00	
TX 5 (hex)	2012	00	
TX 6 (hex)	200F	00	
TX 7 (hex)	200F	00	

For the process area configuration:

- Programme the objects being received and transmitted by indicating the index and sub-index of the objects in the CANopen Dictionary (the sub-index is 0 for VAR objects or the array index for ARRAY objects). Every mapped object can be 16 or 32 bit wide and then use 1 or 2 data words. The max number of words can be 10 in RX and 10 in TX.

RX and TX direction are related to the drive point of view so:

- **RX** refers to data sent by the master to the slave (**master data output**)
- **TX** refers to data sent by the slave to the master (**master data input**)
- Store parameters: use STORE USER button of the S-SW-SETUP (see S-MAN-SW manual)
- Switch the drive off and then on again

### 5.1.2 Input data mapping (RX)

Name	Description
RX0_INDEX	Receive Object0 Index
RX0_SUB_INDEX	Receive Object0 Sub-Index
RX1_INDEX	Receive Object1 Index
RX1_SUB_INDEX	Receive Object1 Sub-Index

.....

.....

RX7_INDEX	Receive Object7 Index
RX7_SUB_INDEX	Receive Object7 Sub-Index

### 5.1.3 RX mapping

Parameter	TX Mapping		Manufacturer specific profile area		Data Type
	Index	SubIndex	Index	SubIndex	
Control Word 32bit	2EA0	00 h	0134	00 h	UNSIGNED32
Flow Setpoint Fieldbus	2EA1	00 h	0132	00 h	INTEGER32
Pressure Setpoint Fieldbus	2EA2	00 h	0144	00 h	INTEGER32

#### RX mapping example:

Name	Index	Description
RX0_INDEX	2EA0	Control Word 32bit
RX0_SUB_INDEX	00	
RX1_INDEX	2EA1	Flow Setpoint Fieldbus
RX1_SUB_INDEX	00	

#### 5.1.4 Output data mapping (TX)

Name	Description
TX0_INDEX	Transmit Object0 Index
TX0_SUB_INDEX	Transmit Object0 Sub-Index
TX1_INDEX	Transmit Object1 Index
TX1_SUB_INDEX	Transmit Object1 Sub-Index

.....

.....

TX7_INDEX	Transmit Object7 Index
TX7_SUB_INDEX	Transmit Object7 Sub-Index

### 5.1.5 TX mapping

Parameter	TX Mapping		Manufacturer specific profile area		Data Type
	Index	SubIndex	Index	SubIndex	
Flow Setpoint Analog	2EB0	00 h	03C6	00 h	INTEGER32
Flow Demand	2EB3	00 h	03D8	00 h	INTEGER32
Speed Actual	2EB4	00 h	03E0	00 h	INTEGER32
Speed Error	2EB5	00 h	03FC	00 h	INTEGER32
Pressure Setpoint Analog	2EB6	00 h	03C4	00 h	INTEGER32
Pressure Demand	2EB9	00 h	03EA	00 h	INTEGER32
Pressure Actual	2EBA	00 h	03D2	00 h	INTEGER32
Pressure Error	2EBB	00 h	03FA	00 h	INTEGER32
Pressure PID Feed Forward	2EBC	00 h	n.a.	n.a.	INTEGER16
Pressure PID Proportional	2EBD	00 h	n.a.	n.a.	INTEGER16
Pressure PID Integral	2EBE	00 h	n.a.	n.a.	INTEGER16
Pressure PID Derivative	2EBF	00 h	n.a.	n.a.	INTEGER16
Pressure PID Output	2EC0	00 h	03DC	00 h	INTEGER32
Speed Demand	2EC1	00 h	03DE	00 h	INTEGER32
Status Word 32bit	2EC2	00 h	03EE	00 h	UNSIGNED32
Q_INPUT Actual	2EC3	00 h	03C2	00 h	INTEGER32
P_INPUT Actual	2EC4	00 h	03C0	00 h	INTEGER32
TR1 Actual	2EC5	00 h	03CC	00 h	INTEGER32
Drive IGBT Temperature	2EC6	00 h	03AD	00 h	INTEGER16
Drive Radiator Temperature	2EC7	00 h	0399	00 h	INTEGER16
Drive CPU Temperature	2EC8	00 h	03A8	00 h	INTEGER16
Motor Temperature	2EC9	00 h	039A	00 h	INTEGER16
Drive DC Bus Voltage	2ECA	00 h	0398	00 h	INTEGER16
Stator Voltage	2ECB	00 h	n.a.	n.a.	INTEGER16
Power Actual	2ECC	00 h	0381	00 h	INTEGER16
Flux Current PID Output	2ECD	00 h	0396	00 h	INTEGER16
Torque Current PID Output	2ECE	00 h	0394	00 h	INTEGER16
Torque Current Demand	2ECF	00 h	0387	00 h	INTEGER16
Torque Current Actual	2ED0	00 h	038F	00 h	INTEGER16
Flux Current Demand	2ED1	00 h	0388	00 h	INTEGER16
Flux Current Actual	2ED2	00 h	0390	00 h	INTEGER16
Motor Total Current Actual	2ED3	00 h	038B	00 h	INTEGER16

#### TX mapping examples:

Name	Index	Description
TX0_INDEX	2EBA	Pressure actual
TX0_SUB_INDEX	00	
TX1_INDEX	2EB4	Speed actual
TX1_SUB_INDEX	00	

## 5.2 Acyclic Communication

In addition to the cyclic I/O data exchange PROFINET allows also for acyclic communication from master to slaves using Record-Data Read and Write services that act like a mailbox system.

There are several Data Records pre-defined by PROFINET standard and used for device configuration and management.

Atos drive support an additional custom Data Record for asynchronous accessing to all the converter parameters and run-time data: this is Data Record with index 502 (0x1F6).

### Example:

if the PROFINET master write into Record-Data 502 the following 6 bytes:

	Function Code	Param Code HI	Param code Lo	N of register. HI	N of Register Lo
0x01	0x03	0x01	0x08	0x00	0x01

the reply readed back from Record-Data 502 will be the following 5 bytes:

	Function Code	Byte Count	Data Hi	Data Lo
0x01	0x03	0x02	0x00	0x05

Function code:

Code	Function	Description
03	Read Holding Registers	Reading of memorised data
06	Preset Single Register	Writing of memorised data

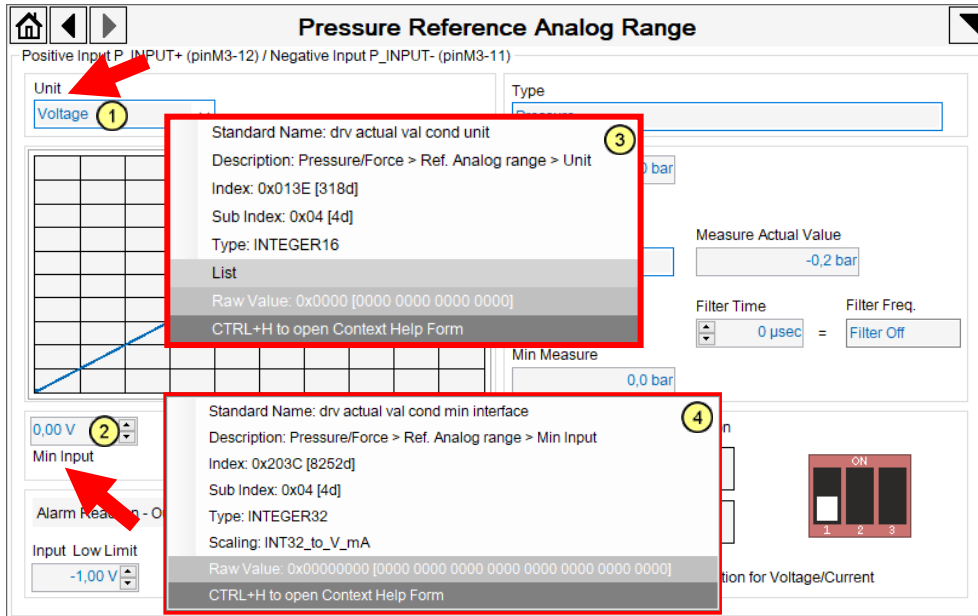
## 6 OBJECT DICTIONARY

### 6.1 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:

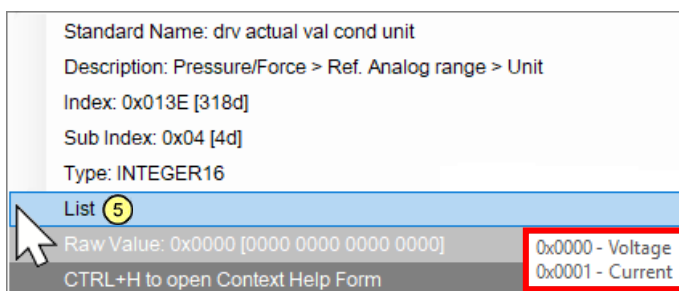
Click right button of the mouse on **Unit** control (1) or **Min Input** control (2) to open the related fieldbus communication windows (3) and (4).



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:	Parameter address
Sub Index:	
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 CTRL+H to open Context Help Form (see CTRL+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 CTRL+H on PC keyboard 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

The screenshot shows the 'Pressure Reference Analog Range' configuration window. The 'Unit' is set to 'Voltage' and 'Type' is 'Pressure'. The 'Max Measure' is 280,0 bar and 'Min Measure' is 0,0 bar. The 'Polarity' is 'Normal' and 'Measure Actual Value' is -0,2 bar. The 'Filter Time' is 0 μsec and 'Filter Freq.' is 'Filter Off'. The 'Wizard Reference Configuration' shows 'Voltage Standard' and 'Current 4..20 mA'. A warning message states: 'Warning: Check the dip-switch configuration for Voltage/Current'. To the right, an 'Information' window is open but all its input fields are empty.

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

Example: "Polarity" parameter selected

The screenshot shows the 'Pressure Reference Analog Range' configuration window. The 'Polarity' dropdown menu is highlighted with a red box, and a mouse cursor is pointing at it. The 'Information' window is now populated with data for the 'Polarity' parameter. The 'Standard Name' is 'drv actual val cond sign'. The 'Description' is 'Pressure/Force > Ref. Analog range > Polarity'. The 'Index' is '0x214C [8524d]' and the 'Sub Index' is '0x04 [4d]'. The 'Type' is 'INTEGER16'. The 'List' shows '[L] Polarity'. The 'Raw Value' is 'd: 1' and 'h: 0x0001', with the binary representation 'b: 0000 0000 0000 0001' at the bottom.

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

**Informations**

**Polarity**

Standard Name: drv actual val cond sign

Description: Pressure/Force > Ref. Analog range > Polarity

Index: 0x214C [8524d] Sub Index: 0x04 [4d]

Type: INTEGER16

List: [L] Polarity

Raw Value: d: 1 h: 0x0001  
b: 0000 0000 0000 0001

List information are displayed

**Informations**

**Polarity**

Standard Name: drv actual val cond sign

Description: Pressure/Force > Ref. Analog range > Polarity

Index: 0x214C [8524d] Sub Index: 0x04 [4d]

Type: INTEGER16

List: [L] Polarity

Raw Value: d: 1 h: 0x0001  
b: 0000 0000 0000 0001

Value:	Description
0x0001	Normal
0xFFFF	Inverted

## 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:

$$Raw\ Value \quad \boxed{A\_raw: (Most\ Significant\ Word) \quad B\_raw: (Less\ Significant\ Word)}$$

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

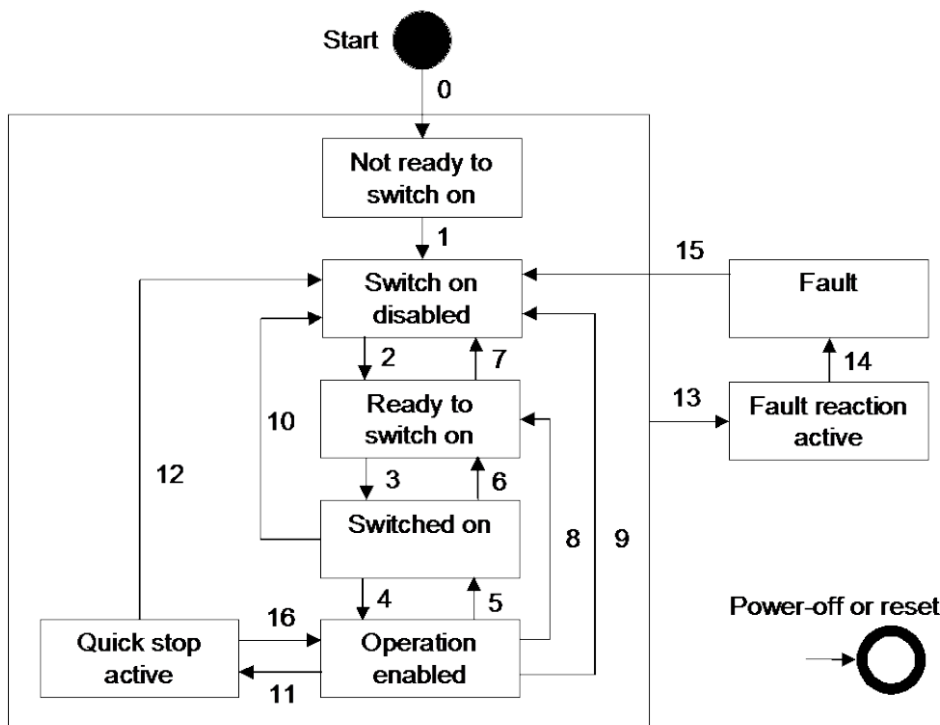
### Control

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 (GSDML)

The characteristics of an IO Device are described by the device manufacturer in a General Station Description (GSD) file. The language used for this purpose is the GSDML (GSD Markup Language) - an XML based language. For I/O data, the GSDML file describes the structure of the cyclic input and output data transferred between the Programmable Controller and the PROFINET IO Device. Any mismatch between the size or structure of the input and output data and the actual internal device structure generates an alarm to the controller.

GSDML files are included in MyAtos.





