NG QUARK

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VTB Software Resources

Rev. 1.0.1

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1 Preface

This document is refered to NGQ Board HARDWARE resources usable with VTB language
For more details to VTB language, see the following links:

Programming Guide
Objects Guide

The following examples, are not refered to real applications

2 RS232/RS485 Port

The NGQ allows to use 1 RS232/485 port, with a custom or standard (MODBUS RTU) protocols.

2.1 SER_SETBAUD

Programming the BaudRate of the second SERIALE PORT - SER2.

Syntax

SER_SETBAUD (Baud as long) as void

Parameters

Baud Value of Baud Rate. The standard value are:
1200-2400-4800-9600-19200-38400-57600-115200

2.2 SER_MODE

Programming the mode of the second SERIAL PORT. If this function is never called, by default the port is programmed with:
No parity
8 bit per character
1 bit stop.

Syntax

SER_MODE(par as char, nbit as char, nstop as char) as void

Parameters

par Parity (0=no parity, 1=odd parity, 2=even parity)
nbit Number of bits per character (7 or 8)
nstop Number of stop bits (1 or 2)

2.3 SER_GETCHAR

Reads the receive buffer of the serial port. It doesn't wait for the presence of a character.
This function, must be calling, in POLLING by VTB application
The operating System, manages the INTERRUPT BUFFER

Syntax

SER_GETCHAR () as int

Return Value

int ***-1*** No character is in the buffer
>=0 Code (0 to 255) of the character read from the buffer

2.4 SER_PUTCHAR

ISends a character to the serial port.

Syntax

SER_PUTCHAR (Car as int) as void

Parameters

Car Code (0 to 255) of the character to send

2.5 SER_PUTS

Sends a string of characters to the serial port. The string must be ended with the character 0 (NULL).

Syntax

SER_PUTS (str as *char) as void

Parameters

***str** String Pointer

2.6 SER_PRINTL

SFormatting print of an INTEGER value.

Syntax

SER_PRINTL (format as *char,val as long) as void

Parameters

Format	String corresponding to the format to be printed
Val	Any integer value or expression

Avalaible formats

######	Print a fixed number of characters	23456
###.###	Force the print of decimal point	123.456
+####	Force the print of the sign	+1234
#0.##	Force the print of a ZERO	0.12
X####	Print in HEXADECIMAL format	F1A3
B####	Print in BINARY format	1011

2.7 SER_PRINTF

Formatting print of a FLOAT value. It is the same as ***ser_printl*** but use a float value

Syntax

SER_PRINTF (const char *format, val as float) **as void**

Parameters

Format	String corresponding to the format to be printed
Val	Any integer value or expression

2.8 SER_PUTBLK

Sends a precise number of characters to the serial port. Unlike the function ***ser_puts*** it allows to send also the character with 0 code enabling the managing of binary protocols, furthermore it starts the background transmission setting in appropriate mode the RTS signal useful to work with RS485 lines.

WARNING

This function allows to manage BINARY and RS485 protocols

Syntax

SER_PUTBLK (Buffer as *char, Len as int) as void

Parameters

***Buffer**	Pointer to the data buffer to send
Len	Number of bytes to send

2.9 SER_PUTST

Reads the state of background transmission started by ***ser_putblk.***

Syntax

SER_PUTST () as int

Return Value

int	***-1***	Transmit error
	>=0	Number of characters to be transmitted

2.10 Example

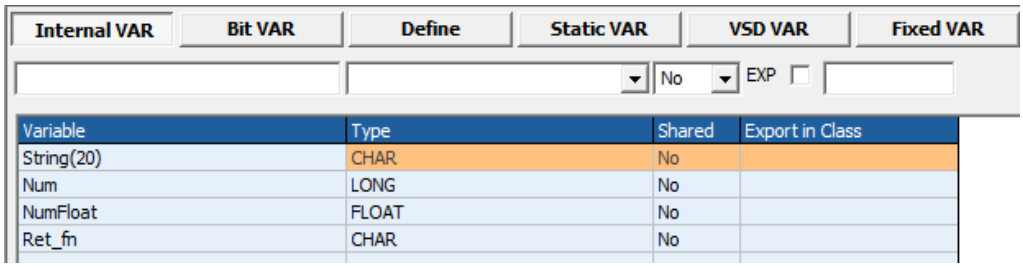
In the following example, is call the Read_Data() function, in polling in the Task Main
SER2 Setting:

Baud rate → ***115,200***
Nr. bit dati → ***8***
Nr. bit Stop → ***1***
Parità → ***NO***

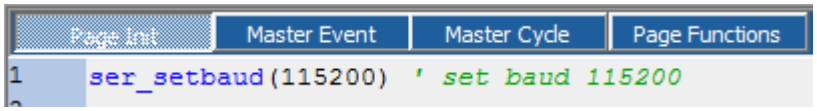
Response value:

Character received =1 → Echo charatcer reveived (1) with ser_putchar
Character received =2 → Send Text "Test String" with Ser_puts
Character received =3 → Formatted Print Variable Num (number of characters received)
Character received =4 → Formatted Print Variable NumFloat (Float random)
Character received =5 → Send in Binary mode Nr. 789488 with Ser_putblk
Character received =6 → Test state Ser_putblk - reply:
255 send data error
Nr characters in the transmission buffer
Character received=Others → Response 254 - Error unknown command

Variables used

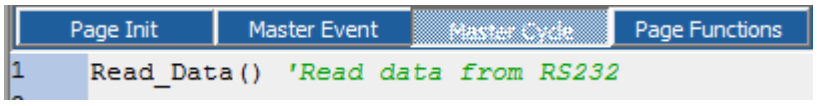


Code in Init Main




```
ser_setbaud(115200) ' set baud 115200
```

Code in Master Ciclo Main




```
Read_Data() 'Read data from RS232
```

Code in Page Functions Main

Page Init | Master Event | Master Cycle | Page Functions

```
'****************************
'Read Data From RS232
'****************************
function Read_Data() as void
Ret_fn=Ser_getchar()     ' Read one char from RS232 buffer
if Ret_fn=-1 ' none
    return ' return
endif
```

```
'****************************
'Read Data From RS232
'****************************
function Read_Data() as void

Ret_fn=Ser_getchar()     ' Read one char from RS232 buffer
if Ret_fn=-1 ' none
      return ' return
endif
inc Num      ' increases the received chars
NumFloat=Num*2.13 'random number
'process data received
select Ret_fn
      case 1 ' ------ echo char with send_putchar
            Ser_putchar(Ret_fn)      ' send reply echo char
      case 2 ' ------ send string with ser_puts
            strcpy(String(),"Test String") ' Copy in array string text
            ser_puts(String()) ' put data
      case 3 ' ------ print a long formatted with ser_printl
            ser_printl("###.##",Num) ' print ex: 123.45 format
      case 4 ' ------ print a float formatted with ser_printf
            ser_printf("####.###",NumFloat) ' print NumFloat
      case 5 ' ------ put a block with ser_putblk
            'Send a number 789488
            String(0)=0xF0 'LSB
            String(0)=0xOB
            String(0)=0x0C
            String(0)=0 'MSB
            Ser_putblk(String(),4) ' Data len 4 byte
      case 6 ' ------ test if ser_putblk is busy
            Ret_fn= Ser_putst() ' check if function ser_putblk is busy
            if Ret_fn=-1
                  Ser_putchar(255)  ' send error
            else
                  Ser_putchar(Ret_fn)      ' send number of chars
            endif
      case else
            Ser_putchar(254)  ' send error no char
endselect

endfunction
```

Example Download

3 Modbus RTU

The SER2 port, is able to manage the RTU MODBUS protocol.
The protocol MODBUS RTU is available in two configuration:
Master
Slave

3.1 Modbus RTU Slave Object

Thsi Object, manage, the RTU MODBUS SLAVE protocol.

Property

Nodo	Node slave
BaudRate	baud rate
PtData()	Array Data Register in the NGQ memory
Max Len Data	Data Register dimension
TimeOut	Master Time Out (millisecond) This must be smallest by a MASTER TimeOut

Methods

No

The following requests are handled MODBUS RTU:

Function Code 3	Read Multiple Registers
Function Code 6	Preset Single Registers
Function Code 16	Preset Multiple Registers

Events

No

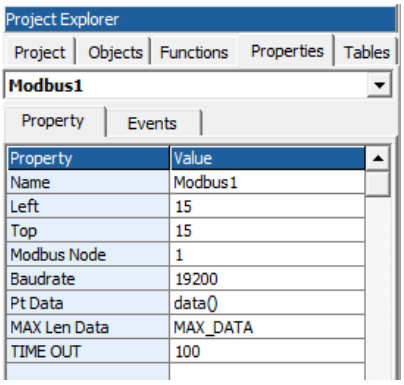
3.2 Example ModBus slave

In the next example,are read and written, some registers 16 bit declared in the NGQ memory.
The registers array is named **Data,** and the maximum dimension, is in the DEFINE **MAX_DATA**

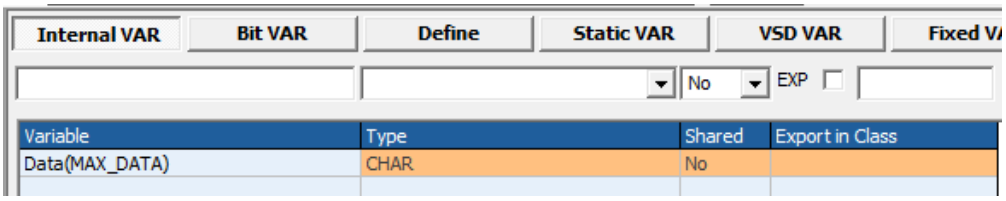
Where :
Read/Written from Modbus register Nr.1 → Data(0)
Read/Written from Modbus register Nr.2 → Data(1)
etc.
The example, Read the data register Nr. 2 - Data(1) and written the Data register Nr1 - Data(0)

Objects used:

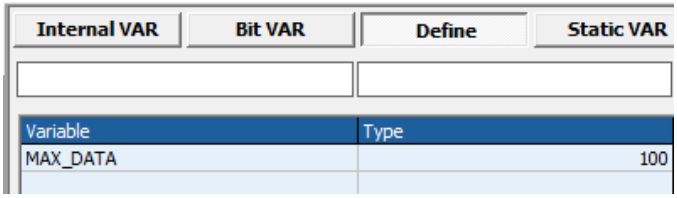
Modbus → Cmodbus → ModBus Protocol



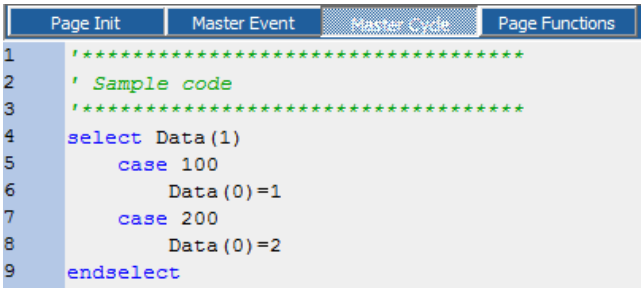
Variables used



DEFINE Used



Code in Master Ciclo Main




```
'*****************************
' Sample code
'*****************************
select Data(1)
      case 100
            Data(0)=1
      case 200
            Data(0)=2
endselect
```

Example Download

3.3 Modbus RTU Master Object

Thsi Object, manage, the RTU MODBUS MASTER protocol.

Property

BaudRate	Comm Baud rate
TimeOut	Time Out for SLAVE response (millisecond). This must be more great by a slaves TimeOut
Parita	0 none - 1 odd - 2 even
N. bit car	Number bit for char
N. bit stop	Number stop bit

Methods

function .write_regn(nodo as char, addr as uint, value as *int) as char

Preset single register func 16 ModBus RTU

Parameters

nodo	Node slave modbus
addr	Start Address register to write (Slave)
Value	Unsigned integer (values to write)

Return

0	Write OK
1	Error respons
2	Time Out
3	Data len > 127

function .read_regn(nodo as char, addr as uint, value as *int) as char

Read single register func 3 ModBus RTU

Parameters

nodo	Node slave modbus
addr	Start Address register to read (Slave)
Value	Pointer to unsigned integer (value to read)

Return

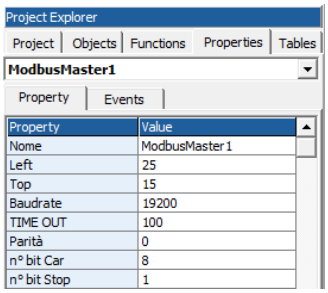
0	Read OK
1	Error respons
2	Time Out
3	lData len > 127
4	Checksum error

3.4 Example ModBus Master

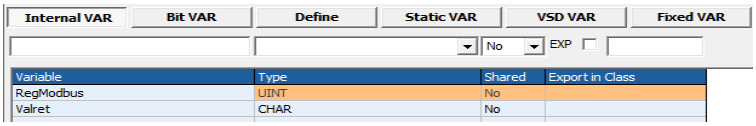
In the next example, are read and written, some registers 16 bit in a slave

Objects used:

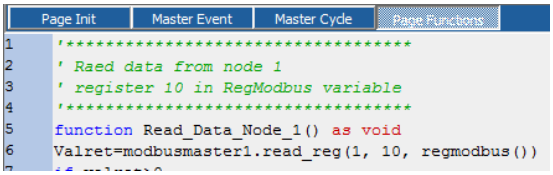
Modbus → CmodbusMaster → ModBus Master Protocol



Variables used



Code in Main Page Functions




```
'************************************
' Raed data from node 1
' register 10 in RegModbus variable
'************************************
function Read_Data_Node_1() as void
Valret=modbusmaster1.read_regn(1, 10, regmodbus())
if Valret>0
      ' read error
endif
endfunction
'************************************
' Write data to node 1
' register 10 RegModbus variable
'************************************
function Write_Data_Node_1() as void
RegModbus=100
Valret=modbusmaster1.write_regn(1, 10, RegModbus)
if valret>0
      ' write error
endif
endfunction
```

Example Download

4 Analog Inputs Read

The NGQ board, has 4 analog inputs managed by VTB functions
In this Board revision, the analog inputs, have a 12 bit resolution (value from 0 to 4095)

4.1 Inputs Read

Syntax

NG_ADC(Channel **as Char**) **as uint**

Parameters

Channel Channel number (from 0 to 3)

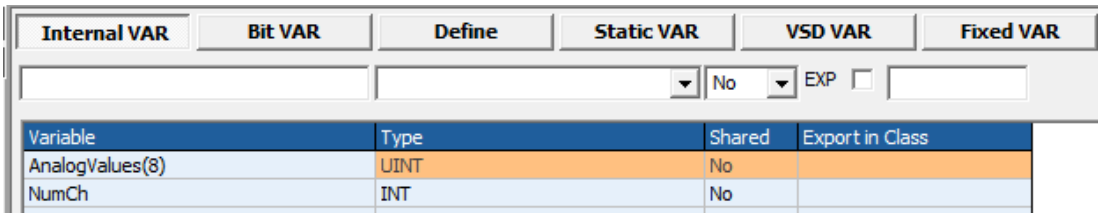
Return Value

Returns the analog value (from 0 to 4095)
Where 0 is the minimum voltage level (0 volt) , 4095 is the maximun voltage level configured in the input (normally 10 Volt)

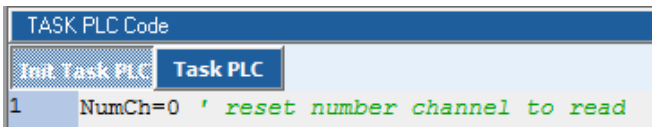
4.2 Example Analog inputs read

In the following example, are read the analog inputs from 0 to 3. the values are written in the array AnalogValues
The channels are read in TaskPlc

Variables used

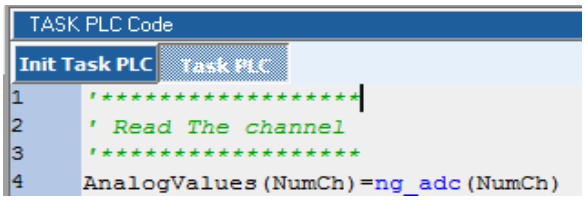


Code in Init TaskPlc




```
NumCh=0      ' reset number channel to read
```

Code in Task Plc




```
'******************
' Read The channel
'******************
AnalogValues(NumCh)=ng_adc(NumCh)
inc NumCh 'increase channel number
if NumCh=4 ' limit
      NumCh=0
endif
```

Example Download

5 CanOpen Management

The NGQ board, can use, one Canopen line Master/Slave
The MASTER port, can use the PDO programmable by CanOpen configuurator.(see Canopen Configurator - Link Chapr. 14)

5.1 PXCO_SDODL

This function allows to send data to a node of the canopen net using the protocol SDO. It is supported only the SDO EXPEDITED mode allowing to send up to 4byte of data length.

Syntax
PXCO_SDODL(node **as char**, index **as int**,subidx **as uchar**,len **as long**,data **as *char**) **as char**

Parameters

Node	Node ID of the SLAVE to whch send data
Index, subindex	Address in the Object-Dictionary of the data to be written
Len	Number of bytes to send
***data**	Pointer to the data to send

Return value

char	**0**	No error
	<>0	Communication error
	=2	The node responded with a SDO ABORT CODE, calling the function ***read_sdoac*** in the system variables _SYSTEM_SDOAC0 e _SYSTEM_SDOAC0 will be available the relative error code.

WARNING
DO NOT USE THIS FUNCTION IN TASK PLC

5.2 PXCO_SDOUL

This function allows to read data from a node of the canopen net using the protocol SDO. It is supported only the SDO EXPEDITED mode allowing to read up to 4byte of data length.

Syntax
PXCO_SDOUL(node **as char**, index **as uint**,subidx **as uchar**,dati **as *char**) **as char**

Parameters

Node	Node ID of the SLAVE to whch send data
Index, subindex	Address in the Object-Dictionary of the data to be written
***data**	Pointer to the data to send

Return value

char	**0**	No error
	<>0	Communication error
	=2	The node responded with a SDO ABORT CODE, calling the function ***read_sdoac*** int the system variables _SYSTEM_SDOAC0 e _SYSTEM_SDOAC0 will be available the relativeerror code.

WARNING
DO NOT USE THIS FUNCTION IN TASK PLC

5.3 READ_SDOAC

Reading of the SDO ABORT CODE sended by a node in the canopen net as answer to a request done with the function PXCO_SDODL or PXCO_SDOUL. The read code will be written in the system variables _SYSTEM_SDOAC0 e _SYSTEM_SDOAC1.
Refer to the DS301 specific of the CAN OPEN for the code error values.

Syntax

READ_SDOAC() **as void**

5.4 PXCO_SEND

Sending of a CAN frame at low level. This function allows to send in the net a CAN frame with a desired COB-ID and DATS. For example it's possible to send manually PDO frames, HEART-BEAT frames, etc.
Should be specified the manage of PDO is managed AUTOMATICALLY by the CANOPEN CONFIGURATOR.

Syntax

PXCO_SEND(id **as int**, Len **as char**,Dati **as *char**) **as char**

Parameters

id	COB-ID value
Len	Number of data to send
***Data**	Pointer to the data buffer

Return value

char	**0**	No error
	<>0	Communication error

5.5 PXCO_NMT

Sending of a NMT frame of the CAN OPEN. NMT protocol allows to set the state of the nodes in the net. Remind that all the nodes correctly configured (canopen configurator) are automatically set in START state.

Syntax

PXCO_NMT(state **as char**, node **as char**) **as char**

Parameters

state	State to set: 1 = START NODE 2 = STOP NODE 128 = PRE-OPERATIONAL 129 = RESET NODE 130 = RESET COMUNICATION
node	Number of the node

Return value

char	**0**	No error
	<>0	Communication error

WARNING
DO NOT USE THIS FUNCTION IN TASK PLC

5.6 READ_EMCY

Reads the last EMERGENCY OBJECT frame sended by a CAN OPEN node.
The emergency code is written in the system array _SYSTEM_EMCY(8) and it will contain all the 8 bytes of the EMERGENCY OBJECT frame as from the DS301 specific of the CAN OPEN. Usually it is called cyclically. The emergency code depends by type of connected device, therefore refer to its manual.

Syntax

```
READ_EMCY() as char
```

Return Value

char	**0**	No error
	<>0	Node that generated the emergency object.

_SYSTEM_EMCY							
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Emergency Error Code		**Error Register**	**Manufacturer specific Error Code**				

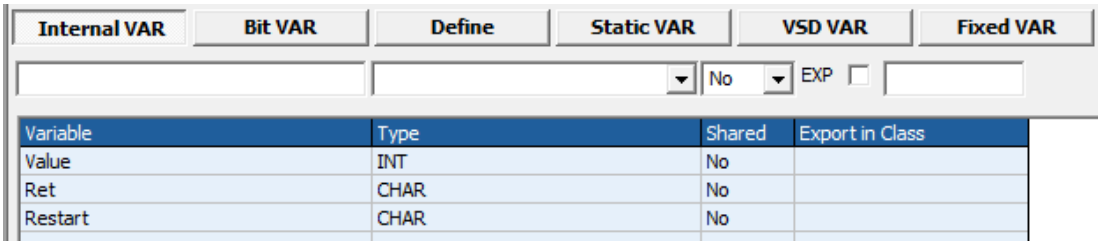
WARNING

THE SYSTEM DOESN'T BUFFER MORE THAN ONE MESSAGE, THEN IF MORE EMERGENCY OBJECT ARE SENDED ALONG A SINGLE TASK PLC, ONLY THE LAST WILL BE READ.
AN EMERGENCY OBJECT DOES NOT MEAN THAT THERE IS ACTUALLY A NODE IN AN EMERGENCY. THE DS301 SPECIFIC PROVIDE THAT AN EMERGENCY OBJECT ARE SEND ALSO ON ALARM RESET. FURTHERMORE SOME DEVICES CAN BE SEND THIS FRAME AT START UP.

5.7 Example CanOpen Functions

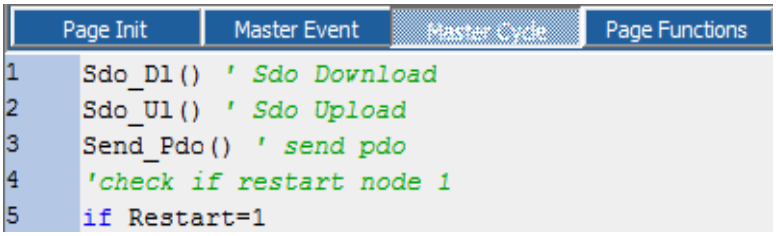
In the following example, are used the Canopen Functions.

Variables used



Variable	Type	Shared	Export in Class
Value	INT	No	
Ret	CHAR	No	
Restart	CHAR	No	

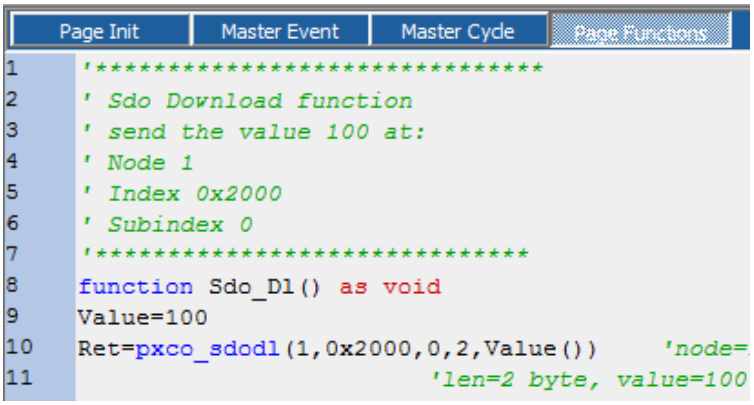
Code in Master Ciclo Main




```
Sdo_Dl() ' Sdo Download
Sdo_Ul() ' Sdo Upload
Send_Pdo() ' send  pdo
'check if restart node 1
if Restart=1
      Restart=0 ' reset flag restart
      Ret=pxco_nmt(1,1) ' Start Node
      if Ret<>0   'test error
            '...
      endif
endif

'polling emergency object
Ret=Read_emcy()
if Ret<>0
      ' in Ret node error
      ' in _SYSTEM_EMCY code error
endif
```

Code in Main Page Functions




```
'*******************************
' Sdo Download function
' send the value 100 at:
' Node 1
' Index 0x2000
' Subindex 0
'*******************************
function Sdo_Dl() as void
Value=100
Ret=pxco_sdodl(1,0x2000,0,2,Value())'node=1, index=0x2000, subidx=0,
                                    'len=2 byte, value=100
if Ret<>0   'test error
      if Ret=2
            read_sdoac()'Read SDO ABORT CODE
            'in _SYSTEM_SDOAC0 code error
            'in _SYSTEM_SDOAC1 code error
      endif
      '...
endif
endfunction

'*******************************
' Sdo Upload function
' read the value at:
' Node 1
' Index 0x2000
' Subindex 0
'*******************************
function Sdo_Ul() as void
Ret=pxco_sdoul(1,0x2000,0,Value())  'node=1, index=0x2000, subidx=0,
                                    'read in value
if Ret<>0   'test error
      if Ret=2
            read_sdoac()'Read SDO ABORT CODE
            'in _SYSTEM_SDOAC0 code error
            'in _SYSTEM_SDOAC1 code error
      endif
      '...
endif
endfunction

'*******************************
' Send PDO
' COB - ID = 0x201
' 2 Bytes
```

```
' SVariable in Value
'*****************************
function Send_Pdo() as void
Value=100
Ret=pxco_send(0x201,2,Value())      'cob-id=0x201) 2 bytes
if Ret<>0   'test error
            '...
endif
endfunction
```

Example Download

5.8 Example CanOpen Axes interpolation mode

In the following example, are managed 3 CanOpen Axes in linear interpolation.

ATTENTION:
All speed are managed in mm/min if setted the following parameters
RapX,RapY,RapZ
All axes target positions are managed in micron (0.001 mm) if setted the following parameters
RapX,RapY,RapZ

Objects used

Motor Control → CobjInterpola → Interpolatore

Project Explorer

Project | Objects | Functions | Properties | Tables

Interp

Property | Events

Property	Value
Nome	Interp
Left	15
Top	10
N.assi	3
N.tratti	16
Vper	1024
Div. Vper	1024
Abilita arcto	1

Motor Control → CstdCanOpen → Ds402 x 3

Project Explorer

Project | Objects | Functions

AxisX

Property | Events

Property	Value
Name	AxisX
Left	10
Top	85
Node	1
Mode	0
Speed	0
Position	0
Abs	True
State	False
home_delay	1000

Project Explorer

Project | Objects | Functions

AxisY

Property | Events

Property	Value
Name	AxisY
Left	55
Top	85
Node	2
Mode	0
Speed	0
Position	0
Abs	True
State	False
home_delay	1000

Project Explorer

Project | Objects | Functions

AxisZ

Property | Events

Property	Value
Name	AxisZ
Left	100
Top	85
Node	3
Mode	0
Speed	0
Position	0
Abs	True
State	False
home_delay	1000

Are managed the following functions:

Wait_Move – Axes state movement
Parameters *No*
Return *1 Axes in movement*
0 Axes stop

Move_Axes – Move the Axes in linear interpolation
Parameters *Vel → Feed Axes in mm/min*
Flg → Set to 1 for disable the movements buffer
(Stop axes at end trajectory)
Set to 0 for enable the movements buffer
(Stop Axes only if edge > SGLP)
Px,Py,Pz → Axes target values in 0.001 mm
Return *0 Movement inserted in the buffer – buffer empty*
1 Buffer full (you must repeat Move_Axes up to when buffer empty)

Acc_Axes – Set interpolation Acceleration
Parameters *Value → Value in count per TAU*
Return *No*

Stop_Axes – Stop Axes
Parameters *No*
Return *No*

Enable_Axis_X_Y_Z – Enable the Axes control and preset at value 0
Parameters *No*
Return *No*

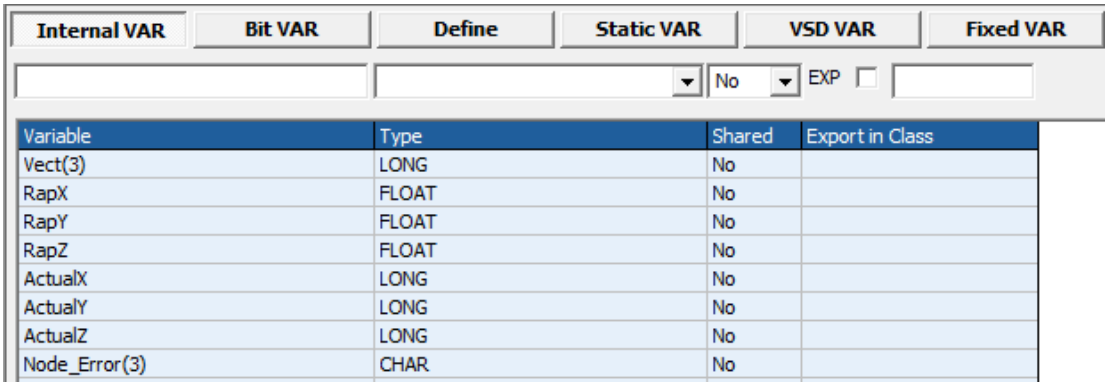
Disable_Axis_X_Y_Z – Disable the Axes control
Parameters *No*
Return *No*

cancfgerr – CanOpen Custom Error. This function is called at Canopen Node init (node setted in configuration by Canopen configurator) when the node, reply error
Parameters *Node → Node number in error*
Err → Error code
Return *No*

Close_cancfgerr - CanOpen Custom Error. This function is called at end Canopen nodes configuration
Parameters *No*
Return *No*

Open_cancfgerr - CanOpen Custom Error. This function is called at start Canopen nodes configuration
Parameters *Nodes → Nodes number in configuration*
Return *No*

Variables used

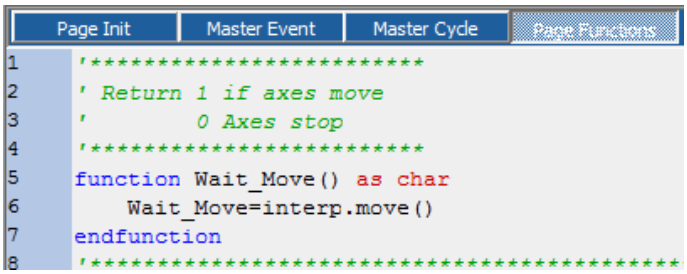


Internal VAR | Bit VAR | Define | Static VAR | VSD VAR | Fixed VAR

No | EXP

Variable	Type	Shared	Export in Class
Vect(3)	LONG	No	
RapX	FLOAT	No	
RapY	FLOAT	No	
RapZ	FLOAT	No	
ActualX	LONG	No	
ActualY	LONG	No	
ActualZ	LONG	No	
Node_Error(3)	CHAR	No	

Code in Main Page Functions



Page Init | Master Event | Master Cycle | Page Functions

```
'*************************
' Return 1 if axes move
'        0 Axes stop
'*************************
function Wait_Move() as char
    Wait_Move=interp.move()
endfunction
'*****************************************
```

```
'*************************
' Return 1 if axes move
'        0 Axes stop
'*************************
function Wait_Move() as char
      Wait_Move=interp.move()
endfunction

'************************************************************
' Move Axes
' Vel= interp vel Axes in mm/min
' Flg if 1 move without buffer
'        0 move in buffer mode
' Px,Py,Pz Axes value in 0.001 mm
'Return 1 if movement is inserted in the buffer
'       0 The movement is not inserted in the buffer
'         in this case, is necessary reload the movement
'************************************************************
function Move_Axes(Vel as long, Flg as char, Px as long, Py as long,Pz as
long) as char
      Vel=Vel*TAU/60 ' Transform in mm/min
      Vect(0)=Px
      Vect(1)=Py
      Vect(2)=Pz
      Move_Axes=interp.moveto(Vel, Flg, Vect())
endfunction

'************************************************************
' Set ACC
' Value Acc value in count
'************************************************************
function Acc_Axes(Value as long) as void
```

```
      interp.acc=Value
endfunction
'*************************************************************
' Stop Axes
'*************************************************************
function Stop_Axes() as void
      interp.stop()
endfunction
'********************
' Axis X enable
'********************
function Enable_X() as void
AxisX.modo=0 ' remove interpolation mode
AxisX.start=0 ' stop PDO Qx
'Preset Axis X 0, not change y,z
Vect(0)=0
Vect(1)=interp.pc(1)
Vect(2)=interp.pc(2)
interp.preset(Vect())
AxisX.home=0 'preset driver
'enable axis
AxisX.enable=1
AxisX.start=1 ' start PDO Qx
AxisX.modo=2 ' set interpolation mode
endfunction
'********************
' Axis X Disable
'********************
function Disable_X() as void
AxisX.enable=0
endfunction

'********************
' Axis Y enable
'********************
function Enable_Y() as void
AxisY.modo=0 ' remove interpolation mode
AxisY.start=0 ' stop PDO Qx
'Preset Axis Y 0, not change x,z
Vect(0)=interp.pc(0)
Vect(1)=0
Vect(2)=interp.pc(2)
interp.preset(Vect())
AxisY.home=0 'preset driver
'enable axis
AxisY.enable=1
AxisY.start=1 ' start PDO Qx
AxisY.modo=2 ' set interpolation mode
endfunction

'********************
' Axis Y Disable
'********************
function Disable_Y() as void
AxisY.enable=0
endfunction

'********************
' Axis Z enable
```

```
'********************
function Enable_Z() as void
AxisZ.modo=0 ' remove interpolation mode
AxisZ.start=0 ' stop PDO Qx
'Preset Axis Z 0, not change x,y
Vect(0)=interp.pc(0)
Vect(1)=interp.pc(1)
Vect(2)=0
interp.preset(Vect())
AxisZ.home=0 'preset driver
'enable axis
AxisZ.enable=1
AxisZ.start=1      ' start PDO Qx
AxisZ.modo=2       ' set interpolation mode
endfunction

'********************
' Axis Z Disable
'********************
function Disable_Z() as void
AxisZ.enable=0
endfunction

'************************
' Error check
' CanOpen node
'************************
function cancfgerr(node as int,err as uchar) as void
Node_Error(node)=err ' copy the code error
endfunction
'************************
' Close init CanOpen
'************************
function close_cancfgerr() as void
endfunction
'************************
' Custom error init
' CanOpen node
'************************
function open_cancfgerr(nodes as int) as void
' Reset nodes  status error
Node_Error(0)=0
Node_Error(1)=0
Node_Error(2)=0
endfunction
```

Code in Init Task PLC

TASK PLC Code

Init Task PLC | Task PLC

```
1  '************************************************
2  'Ex: Motor Encoder Revolution = 10000 i/rev
3  'Motor inserted directly in the Screw 5 mm step
4  'Rap=10000/5000=2
5  '************************************************
6  Rapx=1
7  Rapy=1
8  Rapz=1
```

```
'************************************************
```

```
'Ex: Motor Encoder Revolution = 10000 i/rev
'Motor inserted directly in the Screw 5 mm step
'Rap=10000/5000=2
'************************************************
Rapx=1
Rapy=1
Rapz=1
```

Code in Task PLC

TASK PLC Code

Init Task PLC | Task PLC

```
1   'Write the PDO Axes
2   Qx=interp.pc(0)*RapX
3   Qy=interp.pc(1)*RapY
4   Qz=interp.pc(2)*RapZ
5   'read analog 0 and set the Vper %
6   interp.vper=ng_adc(0)
7   ' copy the axes values
8   ' for ex: display in HMI
```

```
'Write the PDO Axes
Qx=interp.pc(0)*RapX
Qy=interp.pc(1)*RapY
Qz=interp.pc(2)*RapZ
'read analog 0 and set the Vper %
interp.vper=ng_adc(0)
' copy the axes values
' for ex: display in HMI
' value in 0.001 mm
ActualX=interp.pc(0)
ActualY=interp.pc(1)
ActualZ=interp.pc(2)
```

Example Download

5.9 Example CanOpen Axes position mode

In the following example, are management, a CanOpen Axis by VTB OBJECT
See doc Vtb Object Guide for more informations.

WARNING:
All speed are managed in mm/min if setted the following parameters:
MSOF e DSOF
All axes target positions are managed in micron (0.001 mm) if setted the following parameters:
MSOF e DSOF

Objects used:

Motor Control Plus → CobjPos → Posizionatore

Project Explorer

Project | Objects | Functions | Properties

Pos1

Property | Events

Property	Value
Vper	1024
Div. Vper	1024
AccQstop	10
Acc	5
RzeroMode	1
RzeroOffset	0
RzeroPreset	0
RzeroVel	10
RzeroVelf	5
RzeroAcc	10
Msof	10000
Dsof	5000
LimitN	-99999999
LimitP	99999999
Gioco	0
Vgioco	1
MsofV	1
DsofV	1
RZERO ENABLE	True
AXIS TYPE	1
VTB AXIS OBJECT	CanPos1
PDO NAME	qx
STEP CHANNEL	0
STEP NODE	1

Motor Control → CstdCanOpen → Ds402

Project Explorer

Project | Objects | Functions | Properties

CanPos1

Property | Events

Property	Value
Name	CanPos1
Left	75
Top	30
Node	1
Mode	0
Speed	0
Position	0
Abs	True
State	False
home_delay	0

Are managed the following functions:

Wait_Move – Axis state movement
Parameters *No*
Return *1 Axis in movement*
0 Axes stop

Move_Axis – Move the Axis
Parameters *Vel → Feed Axes in mm/min*
Flg → Set to 1 for disable the movements buffer
(Stop axes at end trajectory)
Set to 0 for enable the movements buffer
Px, → Axes target values in 0.001 mm
Return *0 Movement inserted in the buffer – buffer empty*
1 Buffer full (you must repeat Move_Axes up to when buffer empty)

Acc_Axis – Set Acceleration
Parameters *Value → Value in count per TAU*
Return *No*

Stop_Axis – Stop Axes
Parameters *No*
Return *No*

Enable – Enable the Axis control and preset at value 0
Parameters *No*
Return *No*

Disable – Disable the Axes control
Parameters *No*
Return *No*

StartHome – Start homing - Vel in pos1.rzerovel and pos1.rzerovelf
Parameters *No*
Return *No*

CheckHome – Check homing state
Parameters *No*
Return *1 homing finished*

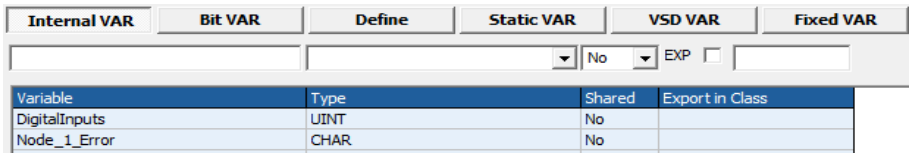
StopHome – Stop homing
Parameters *No*
Return *No*

cancfgerr – CanOpen Custom Error. This function is called at Canopen Node init (node setted in configuration by Canopen configurator) when the node, reply error
Parameters *Node → Node number in error*
Err → Error code
Return *No*

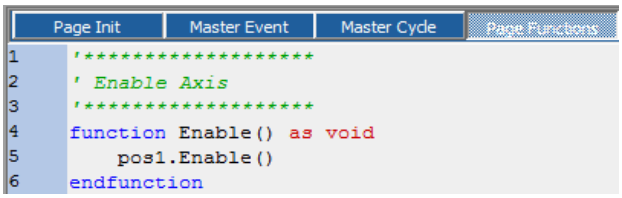
Close_cancfgerr - CanOpen Custom Error. This function is called at end Canopen nodes configuration
Parameters *No*
Return *No*

Open_cancfgerr - CanOpen Custom Error. This function is called at start Canopen nodes configuration
Parameters *Nodes → Nodes number in configuration*
Return *No*

Variables used



Code in Main Page Functions




```
'********************
' Enable Axis
'********************
function Enable() as void
      pos1.Enable()
endfunction
'********************
' Disable Axis
'********************
function Disable() as void
      pos1.Disable()
endfunction
'********************
' Preset Axis
'********************
function Preset(Val as long) as void
      pos1.Preset(Val)
endfunction
'*************************
' Return 1 if axis move
'         0 Axis stop
'*************************
function Wait_Move() as char
      Wait_Move=pos1.move()
endfunction
'********************
' Axis Stop Move
'********************
function Stop() as void
      pos1.Stop()
endfunction
'*****************************
' Start Homing
' Homing input see in task plc
'*****************************
function StartHome() as void
      pos1.StartHome()
endfunction
'*****************************
' Check if homing finished
' Return 1 if finished
'*****************************
function CheckHome() as char
      CheckHome=pos1.status_home
```

```
endfunction
'****************************
' Stop home function
'****************************
function StopHome() as void
      pos1.StopHome()
endfunction
'************************************************************
' Move Axis
' Vel=  vel Axis in mm/min
' Flg if 1 move without buffer
'         0 move in buffer mode
' Px  Axis value in 0.001 mm
'Return 1 if movement is inserted in the buffer
'        0 The movement is not inserted in the buffer
'          in this case, is necessary reload the movement
'************************************************************
function Move_Axis(Vel as long, Flg as char, Px as long) as char
      Vel=Vel*TAU/60 ' Transform in mm/min
      Move_Axis=pos1.moveto(Vel, Flg, Px)
endfunction
'************************************************************
' Set ACC
' Value Acc value in count
'************************************************************
function Acc_Axis(Value as long) as void
      pos1.acc=Value
endfunction
'************************
' Error check
' CanOpen node
'************************
function cancfgerr(node as int,err as uchar) as void
Node_1_Error=err ' copy the code error
endfunction
'************************
' Close init CanOpen
'************************
function close_cancfgerr() as void
endfunction
'************************
' Custom error init
' CanOpen node
'************************
function open_cancfgerr(nodes as int) as void
' Reset node 1 status error
Node_1_Error=0
endfunction
```

Code in Init Task PLC

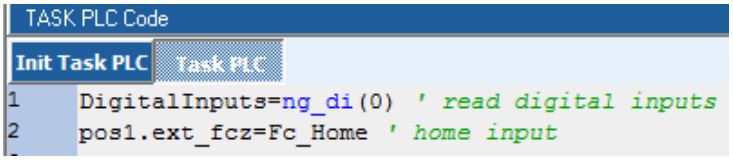
TASK PLC Code

Init Task PLC | Task PLC

```
1    pos1.msof=10000 ' motor 10000 i/rev
2    pos1.ext_fcz=Fc_Home ' home input
```

```
pos1.msof=10000 ' motor 10000 i/rev
pos1.dsof=5000 ' 5 mm per revolution motor
```

Code in task PLC




```
DigitalInputs=ng_di(0) ' read digital inputs
pos1.ext_fcz=Fc_Home ' home input
```

Example Download

6 Digital I/O

The NGQ boards, allows to use 11 digital inputs and 8 digital outputs, management by VTB functions.

6.1 NG_DI – Read Digital Inputs

Read the Digital Inputs state.
The Digital Inputs are bit mapped – from 0 to 10

Input	11	10	9	8	7	6	5	4	3	2	1
Bit	10	9	8	7	6	5	4	3	2	1	0

Syntax

NG_DI(CardNumber **as Char**) **as uint**

Parameters

CardNumber 0

Return Value

Uint Value - 11 inputs bit mapped
bit = 1 → Input ON
bit = 0 → Input OFF

6.2 NG_DO – Writ Digital Outputs

Writes the digital outputs state
The Digital Outputs are bit mapped – from 0 to 7

Output	8	7	6	5	4	3	2	1
Bit	7	6	5	4	3	2	1	0

Syntax

NG_DO(CardNumber **as Char,** StatoOutputs **as Uint**) **as void**

Parameters

CardNumber 0

StatoOutputs Output state
bit = 1 → Output ON
bit = 0 → Output OFF

6.3 Example Digital I/O

In the next example, are managed the Digital I/O in the following mode:

UPDATING I/O IN TASK PLC

Management I/O in bit mode. The first 3 inputs are copied in the first 3 outpts

Variables used

Internal VAR | Bit VAR | Define | Static VAR | VSD VAR | Fixed VAR

No EXP

Variable	Type	Shared	Export in Class
DigOutputs	UINT	No	
DigInputs	UINT	No	

BIT Used

Internal VAR | Bit VAR | Define | Static VAR | VSD VAR

No

Name	Main Variable	NBit	Shared
INP0	DigInputs	0	No
INP1	DigInputs	1	No
INP2	DigInputs	2	No
INP3	DigInputs	3	No
INP4	DigInputs	4	No
INP5	DigInputs	5	No
INP6	DigInputs	6	No
INP7	DigInputs	7	No
INP8	DigInputs	8	No
INP9	DigInputs	9	No
INP10	DigInputs	10	No
OUT0	DigOutputs	0	No
OUT1	DigOutputs	1	No
OUT2	DigOutputs	2	No
OUT3	DigOutputs	3	No
OUT4	DigOutputs	4	No
OUT5	DigOutputs	5	No
OUT6	DigOutputs	6	No
OUT7	DigOutputs	7	No

Code in Task PLC

TASK PLC Code

Init Task PLC | Task PLC

```
1   OUT0=INP0  ' copy input 0 on outpus 0
2   OUT1=INP1  ' copy input 1 on outpus 1
3   OUT2=INP2  ' copy input 2 on outpus 2
```

```
OUT0=INP0 ' copy input 0 on outpus 0
OUT1=INP1 ' copy input 1 on outpus 1
OUT2=INP2 ' copy input 2 on outpus 2
DigInputs=ng_di(0) ' udpate digital inputs
ng_do(0,DigOutputs) ' update digital outputs
```

Example Download

7 Analog Outputs

The NGQ, manage 2 Analog Outputs +/- 10 V 12 bit

7.1 NG_DAC – Write Analog Outputs

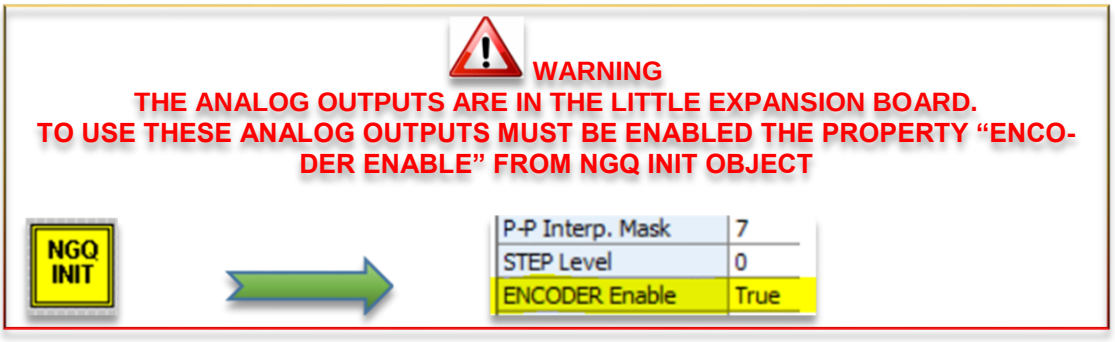
This function allows to update the analog outputs of each channel equipped in the NGQ
These expansions have a digital to analog converter at 12 bit, with a range of +/-10V. Therefore a value of +2047 corresponds to 10V in output, a value of -2047 corresponds to -10V.
The selection of the channel is made by an index from 0 to 7, each expansion manages two channels:

Syntax

NG_DAC(Channel as Char, Val as Long) as void

Parameters

Channel Number of channel (from 0 to 1)
val Analog output value (from -2047 to +2048)



7.2 NG_DAC_CAL - CALIBRATION OF THE ANALOG OUTPUT OFFSET

This function allows to calibrate the OFFSET of the analog outputs. Usually it can be occur that the analog output has a little value of voltage (OFFSET) in the order of mV also if zero has been set. With ***ng_dac_cal*** we can null this voltage setting a value opposite to the offset one. Remind that for each unit the output value will be about 4mV.

Syntax

NG_DAC_CAL(Channel as Char, Offset as Long) as void

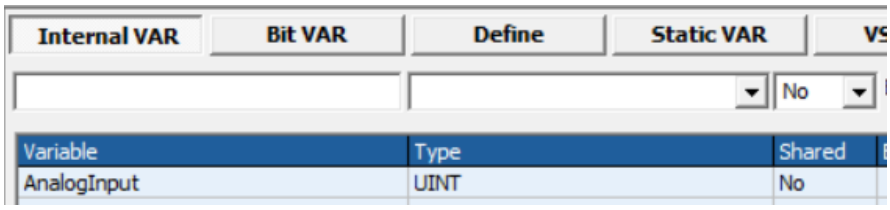
Parameters

Channel Numero Canale (from 0 to 1)
Offset OFFSET value (from -2047 to +2048)

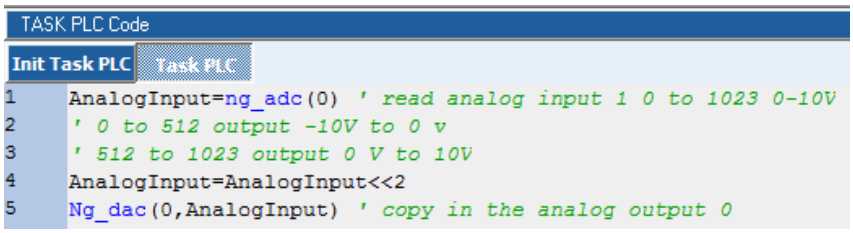
7.3 Example Analog Outputs

In the next example, are managed the analog outputs

Variables used



Code in Task PLC




```
AnalogInput=ng_adc(0) ' read analog input 1 0 to 1024 0-10V
' -2047 0 output -10V to 0 v
' 0 2048 output 0 V to 10V
AnalogInput=AnalogInput-2048
Ng_dac(0,AnalogInput) ' copy in the analog output 0
```

Example Download

8 PULSE/DIR channels on NGQ

The NGQ can use 4 channels PULSE/DIR on CPU

NGQ clock position mode 125 Khz total
NGQ clock interpolation mode 30 Khz total

8.1 PP_STEP – Generating STEP/DIR signals

This function, is the primitive that allows the generation STEP and DIR signal on the specified channel. Generally it is used, by objects that allows to ***"Ramp and Position"*** generator.

Syntax

PP_STEP(Channel **as Char**, Value **as Long**) **as void**

Parameters

Channel	Number of the STEP/DIR channel **f**rom 0 to 3
Value	Absolute value of the position of the step/dir axis

WARNING
THIS FUNCTION MUST BE INSERTED IN TASK_PLC

8.2 PP_PRESET – PRESET OF STEP/DIR POSITION

This function updates the current position of a step/dir channel.

Syntax

PP_PRESET(Channel **as Char**, Value **as Long**) **as void**

Parameters

Channel Numero del canale STEP/DIR
From 0 to 3

Value Valore della posizione che assumerà il l'asse step/dir

WARNING

FOR A CORRECT AXES PRESET, SEE THE EXAMPLE USED IN THE INTERPOLATOR OR POSITIONER

8.3 PP_GETPOS – READING OF ACTUAL POSITION

This function reads the actual position of a step/dir channel. **The value will correspond to the DOUBLE of the real position**.

Syntax

PP_GETPOS(Channel **as Char**) **as long**

Parameters

Channel Number of the STEP/DIR channel

Return Value

Long *Actual position x 2*

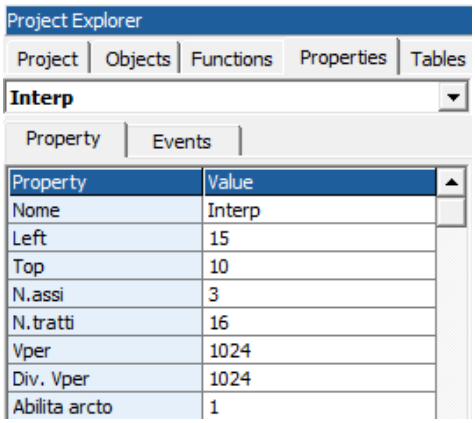
8.4 Example STEP/DIR Axes in Interpolation Mode

In the following example, are managed, 3 STEP/DIR Axes In linear interpolation.

WARNING:
ATTENTION:
All speed are managed in mm/min if setted the following parameters
RapX,RapY,RapZ
All axes target positions are managed in micron (0.001 mm) if setted the following parameters
RapX,RapY,RapZ

Objects used:

Motor Control → CobjInterpola → Interpolatore



Are managed the following functions:

Wait_Move – Axes state movement
Parameters ***No***
Return ***1 Axes in movement***
0 Axes stop

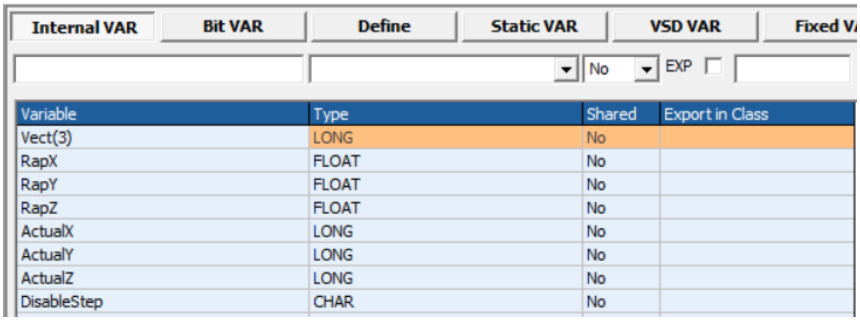
Move_Axes – Move the Axes in linear interpolation
Parameters ***Vel → Feed Axes in mm/min***
Flg → Set to 1 for disable the movements buffer
(Stop axes at end trajectory)
Set to 0 for enable the movements buffer
(Stop Axes only if edge > SGLP)
Px,Py,Pz → Axes target values in 0.001 mm
Return ***0 Movement inserted in the buffer – buffer empty***
1 Buffer full (you must repeat Move_Axes up to when buffer empty)

Acc_Axes – Set interpolation Acceleration
Parameters ***Value → Value in count per TAU***
Return ***No***

Stop_Axes – Stop Axes
Parameters ***No***
Return ***No***

Enable_Axis_X_Y_Z – Enable the Axes control and preset at value 0
Parameters ***No***
Return ***No***

Variables used

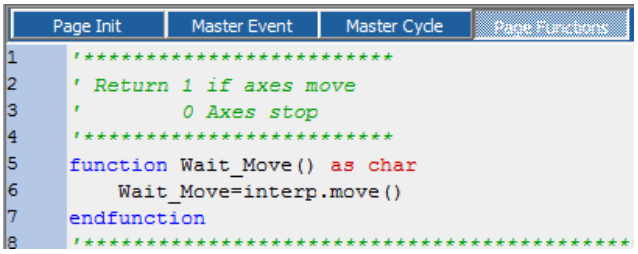


Internal VAR | Bit VAR | Define | Static VAR | VSD VAR | Fixed V

No | EXP

Variable	Type	Shared	Export in Class
Vect(3)	LONG	No	
RapX	FLOAT	No	
RapY	FLOAT	No	
RapZ	FLOAT	No	
ActualX	LONG	No	
ActualY	LONG	No	
ActualZ	LONG	No	
DisableStep	CHAR	No	

Code in Main Page Functions



Page Init | Master Event | Master Cycle | Page Functions

```
'*************************
' Return 1 if axes move
'        0 Axes stop
'*************************
function Wait_Move() as char
    Wait_Move=interp.move()
endfunction
'*****************************************
```

```
'*************************
' Return 1 if axes move
'        0 Axes stop
'*************************
function Wait_Move() as char
      Wait_Move=interp.move()
endfunction

'*********************************************************
' Move Axes
' Vel= interp vel Axes in mm/min
' Flg if 1 move without buffer
'        0 move in buffer mode
' Px,Py,Pz Axes value in 0.001 mm
'Return 1 if movement is inserted in the buffer
'       0 The movement is not inserted in the buffer
'         in this case, is necessary reload the movement
'*********************************************************
function Move_Axes(Vel as long, Flg as char, Px as long, Py as long,Pz as
long) as char
      Vel=Vel*TAU/60 ' Transform in mm/min
      Vect(0)=Px
      Vect(1)=Py
      Vect(2)=Pz
      Move_Axes=interp.moveto(Vel, Flg, Vect())
endfunction

'*********************************************************
' Set ACC
' Value Acc value in count
'*********************************************************
function Acc_Axes(Value as long) as void
      interp.acc=Value
endfunction
```

```
'************************************************************
' Stop Axes
'************************************************************
function Stop_Axes() as void
      interp.stop()
endfunction
'********************
' Axis X enable
'********************
function Enable_X() as void
DisableStep=1
'Preset Axis X 0, not change y,z
Vect(0)=0
Vect(1)=interp.pc(1)
Vect(2)=interp.pc(2)
interp.preset(Vect())
'enable axis
DisableStep0=0
endfunction
'********************
' Axis Y enable
'********************
function Enable_Y() as void
DisableStep=1
'Preset Axis Y 0, not change X,z
Vect(0)=interp.pc(0)
Vect(1)=0
Vect(2)=interp.pc(2)
interp.preset(Vect())
'enable axis
DisableStep=0
endfunction
'********************
' Axis Z enable
'********************
function Enable_Z() as void
DisableStep=1
'Preset Axis Z 0, not change X,Y
Vect(0)=interp.pc(0)
Vect(1)=interp.pc(1)
Vect(2)=0
interp.preset(Vect())
PidZ.posr=0
'enable axis
DisableStep=0
endfunction
```

Code in Init Task PLC

TASK PLC Code

Init Task PLC | Task PLC

```
'*************************************************
'Ex: Motor Encoder Revolution = 10000 i/rev
'Motor inserted directly in the Screw 5 mm step
'Rap=10000/5000=2
'*************************************************
Rapx=1
Rapy=1
Rapz=1
```

Code in Task PLC

TASK PLC Code

Init Task PLC | Task PLC

```
if DisableStep=0 ' disable output step
      pp_step(0, interp.pc(0)*RapX)   'Update the X Axis
      pp_step(1, interp.pc(1)*RapY)   'Update the Y Axis
      pp_step(2, interp.pc(2)*RapZ)   'Update the Z Axis
endif
'read analog 0 and set the Vper %
interp.vper=ng_adc(0)
' copy the axes values
' for ex: display in HMI
' value in 0.001 mm
ActualX=interp.pc(0) ' read actual position X
ActualY=interp.pc(1) ' read actual position Y
ActualZ=interp.pc(2) ' read actual position Z
```

Example Download

8.5 Example STEP/DIR Axis in Position Mode

In the following example, are management, a CanOpen Axis by VTB OBJECT
See doc Vtb Object Guide for more informations.

WARNING:
All speed are managed in mm/min if setted the following parameters:
MSOF e DSOF
All axes target positions are managed in micron (0.001 mm) if setted the following parameters:
MSOF e DSOF

Objects used:

Motor Control Plus → CobjPos → Posizionatore

Property	Value
Nome	Pos1
Left	25
Top	30
N.TRATTI	8
Vper	1024
Div. Vper	1024
AccQstop	10
Acc	5
RzeroMode	1
RzeroOffset	0
RzeroPreset	0
RzeroVel	10
RzeroVelf	5
RzeroAcc	10
Msof	10000
Dsof	5000
LimitN	-99999999
LimitP	99999999
Gioco	0
Vgioco	1
MsofV	1
DsofV	1
RZERO ENABLE	True
AXIS TYPE	2
VTB AXIS OBJECT	0
PDO NAME	0
STEP CHANNEL	0
STEP NODE	0

Are managed the following functions:

Wait_Move – Axis state movement
Parameters *No*
Return *1 Axis in movement*
0 Axes stop

Move_Axis – Move the Axis
Parameters *Vel → Feed Axes in mm/min*
Flg → Set to 1 for disable the movements buffer
(Stop axes at end trajectory)
Set to 0 for enable the movements buffer
Px, → Axes target values in 0.001 mm
Return *0 Movement inserted in the buffer – buffer empty*
1 Buffer full (you must repeat Move_Axes up to when buffer empty)

Acc_Axis – Set Acceleration
Parameters *Value → Value in count per TAU*
Return *No*

Stop_Axis – Stop Axes
Parameters *No*
Return *No*

Enable – Enable the Axis control and preset at value 0
Parameters *No*
Return *No*

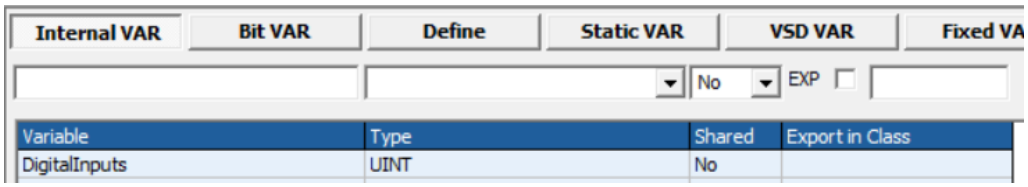
Disable – Disable the Axes control
Parameters *No*
Return *No*

StartHome – Start homing - Vel in pos1.rzerovel and pos1.rzerovelf
Parameters *No*
Return *No*

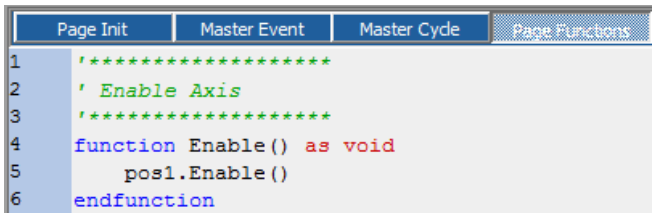
CheckHome – Check homing state
Parameters *No*
Return *1 homing finished*

StopHome – Stop homing
Parameters *No*
Return *No*

Variables used



Code in Main Page Functions




```
'********************
' Enable Axis
'********************
function Enable() as void
      pos1.Enable()
endfunction
'********************
' Disable Axis
'********************
function Disable() as void
      pos1.Disable()
endfunction
'********************
' Preset Axis
'********************
function Preset(Val as long) as void
      pos1.Preset(Val)
endfunction
'*************************
' Return 1 if axis move
'        0 Axis stop
'*************************
function Wait_Move() as char
      Wait_Move=pos1.move()
endfunction
'********************
' Axis Stop Move
'********************
function Stop() as void
      pos1.Stop()
endfunction
'*****************************
' Start Homing
' Homing input see in task plc
'*****************************
function StartHome() as void
      pos1.StartHome()
endfunction
'*****************************
' Check if homing finished
```

```
' Return 1 if finished
'****************************
function CheckHome() as char
      CheckHome=pos1.status_home
endfunction
'****************************
' Stop home function
'****************************
function StopHome() as void
      pos1.StopHome()
endfunction
'*************************************************************
' Move Axis
' Vel=  vel Axis in mm/min
' Flg if 1 move without buffer
'        0 move in buffer mode
' Px  Axis value in 0.001 mm
'Return 1 if movement is inserted in the buffer
'       0 The movement is not inserted in the buffer
'         in this case, is necessary reload the movement
'*************************************************************
function Move_Axis(Vel as long, Flg as char, Px as long) as char
      Vel=Vel*TAU/60 ' Transform in mm/min
      Move_Axis=pos1.moveto(Vel, Flg, Px)
endfunction
'*************************************************************
' Set ACC
' Value Acc value in count
'*************************************************************
function Acc_Axis(Value as long) as void
      pos1.acc=Value
endfunction
```

Code in Init Task PLC

TASK PLC Code

Init Task PLC | Task PLC

```
1   pos1.msof=10000 ' motor 10000 i/rev
2   pos1.ext_fcz=Fc_Home ' home input
```

```
pos1.msof=10000 ' motor 10000 i/rev
pos1.dsof=5000 ' 5 mm per revolution motor
```

Code in Task PLC

TASK PLC Code

Init Task PLC | Task PLC

```
1   DigitalInputs=ng_di(0) ' read digital inputs
2   pos1.ext_fcz=Fc_Home ' home input
```

```
DigitalInputs=ng_di(0) ' read digital inputs
pos1.ext_fcz=Fc_Home ' home input
```

Example Download

9 Permanent Memory

The NGQ, uses 2 tipology permanent memory:

Internal type FLASH 1024 Bytes
External type FRAM 16 Kb (optional)

The difference is the following:

The internal FLASH memory, must be writing with only block to 1024 Bytes
The external FRAM memory, can be writing byte per byte

The memory selection, is by software, using the addr value:

Addr from 0 to 1023 Internal FLASH memory
Addr from 1024 to 17407 External FRAM memory

9.1 Permanent memory

9.1.1 IMS_READ – Read memory

Reads from the memory at address ADDR a number of byte as in NBYTE and writes them in the array pointed by Punt..

Syntax

IMS_READ(Punt as *Char, Addr as Long, Nbyte as Long) as Char

Parameters

Punt	Pointer to data buffer where read data will be saved
Addr	Start address in the reserved area of the device
Nbyte	Number of bytes to be read

Return Value

Char	0	No error
	<>0	Writing error

9.1.2 IMS_WRITE – Write memory

Writes in the memory at the address contained in ADDR, the data pointed by Punt for a total of NBYTE of data.

Syntax

IMS_WRITE(Punt as *Char, Addr as Long, Nbyte as Long) as Char

Parameters

Punt	Pointer to data buffer to be written
Addr	Start address in the reserved area of the device
Nbyte	Number of bytes to be written

Return value:

Char	0	No error
	<>0	Writing error

WARNING
THE EXTERNAL FRAM MEMORY, CAN BE WRITING BYTE per BYTE
THE INTERNAL FLASH MEMORY,MUST BE WRITING WITH BLOCK TO 1024 BYTES

9.2 Example save/load in external FRAM

In the following example, are saved and loaded by FRAM the values in a Long Vector. This example can be used for a machines parameters management .
Is used a Checksum (parameters values sum) and saved in the LAST position of array.
The Checksum is used to ensure, the parameters integrity

Are managed the following functions:

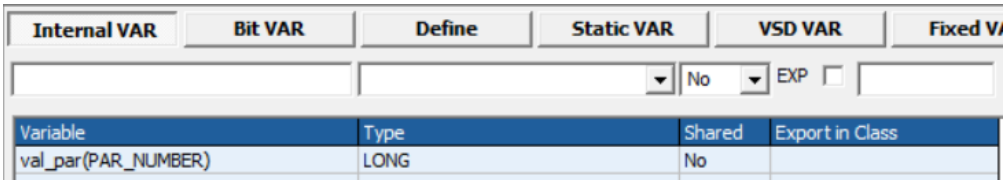
LoadPar – Load from FRAM the values

Parameters ***No***
Return ***0 OK***
1 Error FRAM
2 Error checksum

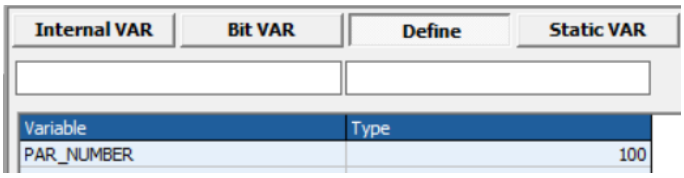
SavePar – Save in FRAM the values

Parameters ***No***
Return ***0 OK***
1 Error FRAM

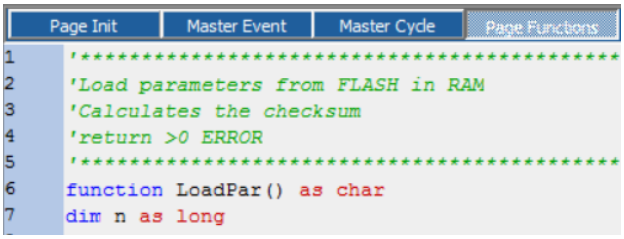
Variables used



DEFINE used



Code in Main Page Functions




```
'*************************************************
'Load parameters from FRAM in RAM
'Calculates the checksum
'return >0 ERROR
'*************************************************
function LoadPar() as char
dim n as long
dim ckl as long
dim ck as long
dim Ret as char
'PAR_NUMBER is number of parameters
```

```
'all parameters are in long
Ret=ims_read(val_par(),1024,PAR_NUMBER*4) ' reads parameters from FRAM
and 'puts in val_par vector


if Ret<>0
      'LOAD ERROR !!!!
      LoadPar=1 'return ERROR 1
      return
endif
ck=val_par(PAR_NUMBER) 'gets the check sum in last position
ckl=0
for n=0 to n<(PAR_NUMBER-1) 'calculates the checksum
      ckl=ckl+val_par(n)
next n
if ckl=0          'if all parameters are ZERO - chekcsum error
      ckl=ck+1
endif
if ckl<>ck
      'CheckSum ERROR
      LoadPar=2 'return ERROR 2
else
      LoadPar=0 'return OK
endif
endfunction

'*********************************
'Save the parameters in FRAM
'Return >0 ERROR
'*********************************
function SavePar() as char
dim ck as long
dim n as long
dim Ret as char
ck=0
for n=0 to n<(PAR_NUMBER)-1 'calculates the checksum
      ck=ck+val_par(n)
next n
val_par(PAR_NUMBER-1)=ck 'put the checksum
Ret=ims_write(val_par(),1024,PAR_NUMBER*4) 'save the parameters
if Ret<>0
      'SAVE ERROR !!!!
      SavePar=1 'return ERROR 1
else
      SavePar=0 'return OK
endif
endfunction
```

Example Download

WARNING
IN THE ABOVE EXAMPLE, IS USED AN ADDR :
1024
THIS DEFINES TO USE AN EXTERNAL FRAM MEMORY

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