OMRON FLEXIBOWL PLUGIN

This plugin was created with the idea of communicating quickly and safely with the FlexiBowl® throuth the Omron PLC N series whith the ethernet on board using LD/SC instructions language.
Whit the plugin developed in Sysmac Studio doesn't required additional licenses and it was develop for comunicate throuth the ethernet board integrated in PLCs Omron.

Requited firmware 1.16 version or higher

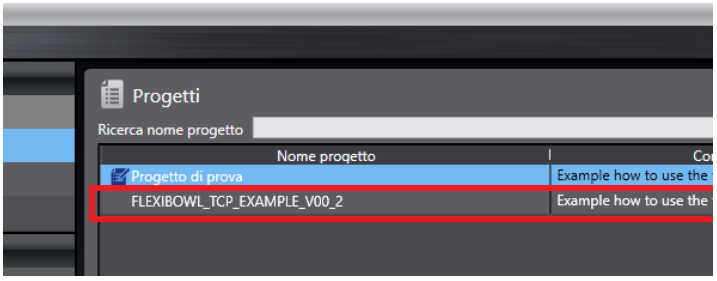
FlexiBowl®

Sysmac Studio

STEP 1:

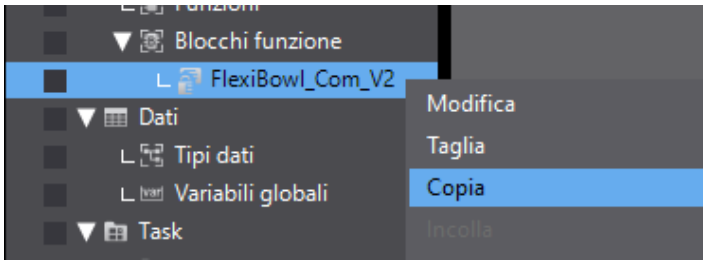
Unpackage the example project by double click on the file "FLEXIBOWL_TCP_EXAMPLE_V00_3"

STEP 2:



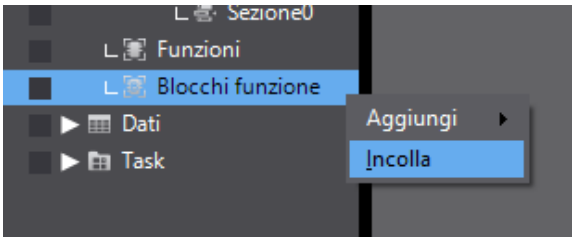
Now open the uncompressed project on the "Open project" section on Sysmac Studio

STEP 3:



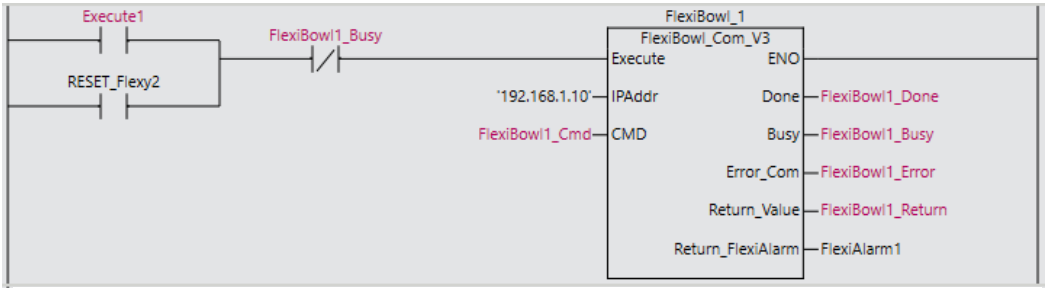
Then copy the function block "FlexiBowl_Com_V3"

STEP 4:



Right click in your project on the "Function block" section in the project's tree then click paste

STEP 5:



Insert now the function block inside your software then populate the block inputs and outputs according to your needs:

TAG	Type	Description
Execute	IN:Bool	Send the present command on the "CMD" input. The block considerate this input into only for one scan of PLC cycle and if communication is established.
IPAddr	IN:String	IP address of the FlexiBowl. Specify the IP address of the Flexibowl. Es: '192.168.0.161' The TCP communication instructions are high level and managed by the PLC ethernet soket therefore even if the FlexiBowl is in another subnet and there is a reference gateway set in the hardware configuration of the PLC it is possible to directly specify the final FlexiBowl IP address.
CMD	IN:String	Command in string format to be sent to the flexiBowl (see table below)

STEP 5:

TAG	Type	Description
ENO	OUT:Bool	Block execution successful without any software error
Busy	OUT:Bool	QX execution in progress by FlexiBowl, therefore no other command can be sent.
Done	OUT:Bool	Last command execution successful. Both on the first scan cycle of the PLC and for each communication error even if a command is not being executed, this bit is set to FALSE. Otherwise it always remains at TRUE following a successfully completed instruction until the next request.
Error	OUT:Bool	This bit is set to TRUE for each communication error and reset each time communication is restored.
Return	OUT:String	Return string from FlexyBowl. In the case of execution of a QX the '**Mooving**' value will be returned until completion. Once the QX instruction has been completed, the value of the last status request to the FlexiBowl will be found until the next execution. In case of a communication error, the value '**Communication Error. Check the flaxiBowl Con**'.
Return_ FlexiAlarm	OUT:Word	Word value holding eventual error code readed from the FlexiBowl driver. See the next table.

COMMAND LIST:

Comandi	Description
QX2	Move
QX3	Move-Flip
QX4	Move-Flip-Blow
QX5	Move-Blow
QX6	Shake
QX7	Light on
QX8	Light off
QX9	Flip
QX10	Blow
QX11	Quick Emptying Option
QX12	Reset Alarm

Tabella Allarmi:

Hex Value	Descrizione
16#0001	Position Limit
16#0002	CCW Limit
16#0004	CW Limit
16#0008	Over Temp
16#0010	Excess Regen
16#0020	Over Voltage
16#0040	Under Voltage
16#0080	Over Current
16#0100	Open Motor Winding
16#0200	Bad Encoder
16#0400	Comm Error
16#0800	Bad Flash
16#1000	No Move
16#2000	Motor Resistance Out of Range
16#4000	Blank Q Segment
16#8000	(not used)

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SCRIPT:

```
// If soket colsed then try to open soket
Time_Open(In:= (NOT Socket_Opened) AND (NOT Time_Open.Q),PT:=T#1S);
Open_trig(Clk:= Time_Open.Q);

SktTCPConnect_instance(                                  // Request a connection.
                        Execute:=Open_trig.Q,
                        SrcTcpPort:=UINT#0,              // Local TCP port number: Automatically assigned.
                        DstAdr:= IPAddr,                 // Remote IP address
                        DstTcpPort:=UINT#7776,           // Destination TCP port number
                        Socket=>WkSocket);               // Socket

 IF SktTCPConnect_instance.Done THEN                     // If the socket is open
                        Socket_Opened:=TRUE;
                        Error_Com := FALSE;
END_IF;

 KeepAlive_Timer(In:= (Socket_Opened AND (NOT Execute) AND (NOT Busy) AND (NOT
KeepAlive_Timer.Q)),PT:=T#20S);
 IF KeepAlive_Timer.Q THEN
            ReadContSts:=TRUE;
            KeepAlive_Flag:=TRUE;
 END_IF;

// ##########################################################################################
// Inizialize data for normal
Exe_trig(CLK := Execute);      // Execution trigger

IF Exe_trig.Q  AND Socket_Opened THEN
   Busy := TRUE;
   Done := FALSE;
   ReadContSts := FALSE;
            ReadAlarm := FALSE;
   Error_Com := FALSE;
            KeepAlive_Flag:=FALSE;

            FOR i := 0 TO 20 DO
      SendSocketDat[i] := 16#00;
            END_FOR;
            SendSocketDat[1] := 16#07;

            FOR i := 0 TO 51 DO
      RcvSocketDat[i] := 16#00;
            END_FOR;
```

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SCRIPT:

```
// ---------------------------------------------
   // Arrange the message to send
   // Headre   16#00 16#07
   // Message  ascii to hex message
   // Footer   16#0D

            ToAryByte(In:=CMD, Order:=_LOW_HIGH, AryOut:=SendSocketDat[2]);          // Convert text command
into array byte
   FOR i := 2 TO 19 DO
      IF SendSocketDat[i] = 16#00 THEN
         SendSocketDat[i] := 16#0D;
         EXIT;
      END_IF;
   END_FOR;
END_IF;
// ---------------------------------------------

ReadAlm_trig(CLK := (NOT ReadContSts));
                                                                  // Execution read alarme trigger

// If ReadContSts funtion active send 'SC' command
IF ReadContSts THEN
   SendSocketDat[0] := 16#00;
   SendSocketDat[1] := 16#07;
   SendSocketDat[2] := 16#53;
   SendSocketDat[3] := 16#43;
   SendSocketDat[4] := 16#0D;
            FOR i := 5 TO 19 DO
            SendSocketDat[i] := 16#00;
   END_FOR;
END_IF;

// If ReadAlarm funtion active send 'AL' command
IF ReadAlm_trig.Q THEN
   SendSocketDat[0] := 16#00;
   SendSocketDat[1] := 16#07;
   SendSocketDat[2] := 16#41;
   SendSocketDat[3] := 16#4C;
   SendSocketDat[4] := 16#0D;
            FOR i := 5 TO 19 DO
            SendSocketDat[i] := 16#00;
   END_FOR;
            ReadAlarm := TRUE;
END_IF;

// ##############################################################################################
// Send data Section
// Calculate Message Size
FOR SndSize := 2 TO 19 DO
            IF (SendSocketDat[SndSize] = 16#0D) THEN EXIT;
   END_IF;
END_FOR;

// Send data
Snd_Trig(CLK := SktTCPRcv_instance.Done OR KeepAlive_Timer.Q);        // Execution trigger
SktClearBuff(Execute:=((Exe_trig.Q OR (Snd_Trig.Q AND ReadContSts) OR ReadAlm_trig.Q) AND
Socket_Opened),
            Socket:=WkSocket);

SktTCPSend_instance(
            Execute:=SktClearBuff.Done,
            Socket :=WkSocket,                        // Socket
            SendDat:=SendSocketDat[0],                // Send data
            Size:= SndSize + 1);                      // Send data size
```

SCRIPT:

```
// ###############################################################################################
// Receive data Section
Rcv_Trig(CLK:= SktTCPSend_instance.Done);      // Execution trigger

SktTCPRcv_instance(
        Execute:=Rcv_Trig.Q,
        Socket :=WkSocket,                    // Socket
        TimeOut:=UINT#0,                      // Timeout time
        Size   :=UINT#52,                     // Receive data size
        RcvDat :=RcvSocketDat[0]);            // Receive data

// Decoding the message from the FlaxiBowl
IF SktTCPRcv_instance.DONE AND (NOT ReadAlarm) THEN
   Return_Value:='';
   FOR i := 2 TO 52 DO
      IF (RcvSocketDat[i] = 16#0D) THEN EXIT;
      END_IF;
   END_FOR;
            Return_Value:=AryToString(In:=RcvSocketDat[2], Size:=i-2);

// If received data from FlaxiBowl (SC= 4 xxx) and ReadContSts funtion active, write 'QX Running' on Return_Value variable
elseif received data from FlaxiBowl (SC= xx 1x) and ReadContSts funtion active, write 'Mooving'

            IF (RcvSocketDat[7] = 16#31) AND ReadContSts THEN
            Return_Value := 'Mooving';
            END_IF;
            IF (RcvSocketDat[5] = 16#34) AND ReadContSts THEN
            Return_Value := 'QX Running';
            END_IF;
END_IF;
```

SCRIPT:

```
// If the check FlexiBowl alarm it's done then set Done and reset Busy and terminate the function
IF SktTCPRcv_instance.DONE AND ReadAlarm THEN
		Return_FlexiAlarm:=STRING_TO_WORD(MID(AryToString(In:=RcvSocketDat[5], Size:=4),UINT#4, UINT#1));
		ReadAlarm := FALSE;
		Busy := FALSE;
   Done := TRUE;
END_IF;

// If 'QX' command sent active ReadContSts funtion
IF SktTCPRcv_instance.DONE AND (SktTCPRcv_instance.RcvSize <> 0) AND (RcvSocketDat[2] = 16#25) AND (NOT
ReadContSts) THEN
   ReadContSts := TRUE;
END_IF;

// If received data from FlaxiBowl and not ReadContSts funtion active, set Done and reset Busy
IF SktTCPRcv_instance.DONE AND (SktTCPRcv_instance.RcvSize <> 0) AND (NOT ReadContSts) AND (NOT ReadAlarm)
THEN
   Busy := FALSE;
   Done := TRUE;
END_IF;

// If received data from FlaxiBowl (SC= 0 001) and ReadContSts funtion active, set Done and reset Busy and terminate the
function
IF SktTCPRcv_instance.Done AND (RcvSocketDat[7] = 16#30) AND ReadContSts THEN
   ReadContSts := FALSE;
END_IF;

IF KeepAlive_Flag AND (SktTCPRcv_instance.RcvSize <> 0) THEN
		KeepAlive_Flag:=FALSE;
END_IF;

// ##############################################################################################
// TimeOut and error management
Timeout_Timer(IN := (((NOT ReadContSts) AND Busy) OR (ReadContSts AND (NOT SktTCPRcv_instance.DONE)) OR
KeepAlive_Flag OR ReadAlarm),
		PT := T#2S);

// Generate error

SktClose_instance(
		Execute:=Timeout_Timer.Q,
		Socket:=WkSocket);

IF Timeout_Timer.Q THEN
		Socket_Opened:=FALSE;
   ReadContSts := FALSE;
		ReadAlarm := FALSE;
		KeepAlive_Flag:=FALSE;
   Busy := FALSE;
   Done := FALSE;
   Error_Com := TRUE;
   Return_Value := 'Communication Error. Check the flaxiBowl Con';
END_IF;
```