

ENTITY: Control Activity

MDI step2.1a Offer requirement

Schneider Department: **Industry Business –
Control Activity**

Document Identification: **xxxxxx**

Project Code: **xxxxxx**

Version: **V 0.4**

Date: **15/10/2012**

Executive definition & objectives: It is the expression and formalization from the customers needs into offer requirements. It corresponds to customer needs to which we have decided to answer. It is the project reference that becomes the commitment of the project team.

Note: the offer is material or immaterial. It includes product, equipment, solutions, systems, and services, provided by the company to satisfy the customer needs. The retained requirement should be associated to a validation; therefore it should be measurable and controllable.

Deliverable Name	Offer Requirements	Stage Gate	
		OPEN	<input type="checkbox"/>
		SELECT	<input type="checkbox"/>
		DO	<input type="checkbox"/>
		IMPLEMENT	<input type="checkbox"/>
		PRODUCE	<input type="checkbox"/>
		SELL	<input type="checkbox"/>
		CLOSE	<input type="checkbox"/>

Status	Draft <input checked="" type="checkbox"/>	In Review <input type="checkbox"/>	Official <input type="checkbox"/>
--------	---	------------------------------------	-----------------------------------

Roles	Function	Name
Authors	Offer Marketing	Lei-Leo Wang
Reviewers		
Approvers		

Document modifications			
Ver. RN	Date dd/mm/yr	Author	Modifications
V0.1	17/07/2012	Lei-Leo Wang	Initialization
V0.2	01/08/2012	Lei-Leo Wang	Import STR that can be reused from M340 offer requirement to keep consistency.
V0.3	17/08/2012	Lei-Leo Wang	Refine and send out for internal review
V0.4	16/10/2012	Lei-Leo Wang	Modify and update, according to review feedbacks.  M1080 OR review feedback.xls

Linked Document			
Name	Reference	Author	Filing

Table of contents

1	INTRODUCTION	5
1.1	Project origin and objective	5
1.1.1	Origin	5
1.1.2	Objective:	5
2	MARKETING REQUIREMENTS	6
2.1	Compliance and Conventions	6
2.1.1	Requirements Terminology	6
3	PROGRAM COMPLIANCE	7
4	MDI STEP 2.1A	7
4.1	Network topology	7
5	PRODUCT FEATURES & MARKETING REQUIREMENTS	9
5.1	Commons requirements of M1080 step 2.1a	10
5.1.1	General requirement	10
5.1.2	Architecture	11
5.1.3	Size	12
5.1.4	Labels	13
5.1.5	Visualization	13
5.1.6	Accessories	13
5.1.7	Power Supply	14
5.1.8	Digital I/O	15
5.1.9	Analog I/O	18
5.1.10	Counting	21
5.1.11	Safety	25
5.1.12	Agency	25
5.1.13	Performances	29
5.1.14	Constraints	29
5.2	CPU	31
5.2.1	Catalogue	31
5.2.2	Application excution performance	31
5.2.3	Memory Application program	31
5.2.4	CPU firmware	36
5.2.5	Physical Configuration	37
5.2.6	Internal Objects	38
5.2.7	Application Execution	39
5.2.8	Hardware	39
5.2.9	Operating Modes	41
5.3	Communication	42
5.3.1	General requirement	42
5.3.2	CPU embedded communication ports	42
5.3.3	Terminal Port	43
5.3.4	Serial Lines	43
5.3.5	CANopen	45
5.3.6	Communication Commons	53

5.3.7	Ethernet	54
5.4	Software Requirements.....	63
5.4.1	Configuration	63
5.4.2	IO organization	64
5.4.3	Explicit exchange	64
5.4.4	I/O adjustment	65
5.5	Quality Ranges	66
5.6	Documentation Requirements.....	66

1 INTRODUCTION

1.1 Project origin and objective

The propose of MDI step 2 is to provide a entry level PLC platform in Mx80 product range to enhance competitiveness of SE medium/small PLC portfolio of Plant Solution offer.

1.1.1 Origin

- Need for simple control within Plant Solutions architectures
- Trend for End User towards unified programming SW to reduce costs throughout the lifecycle of the plant

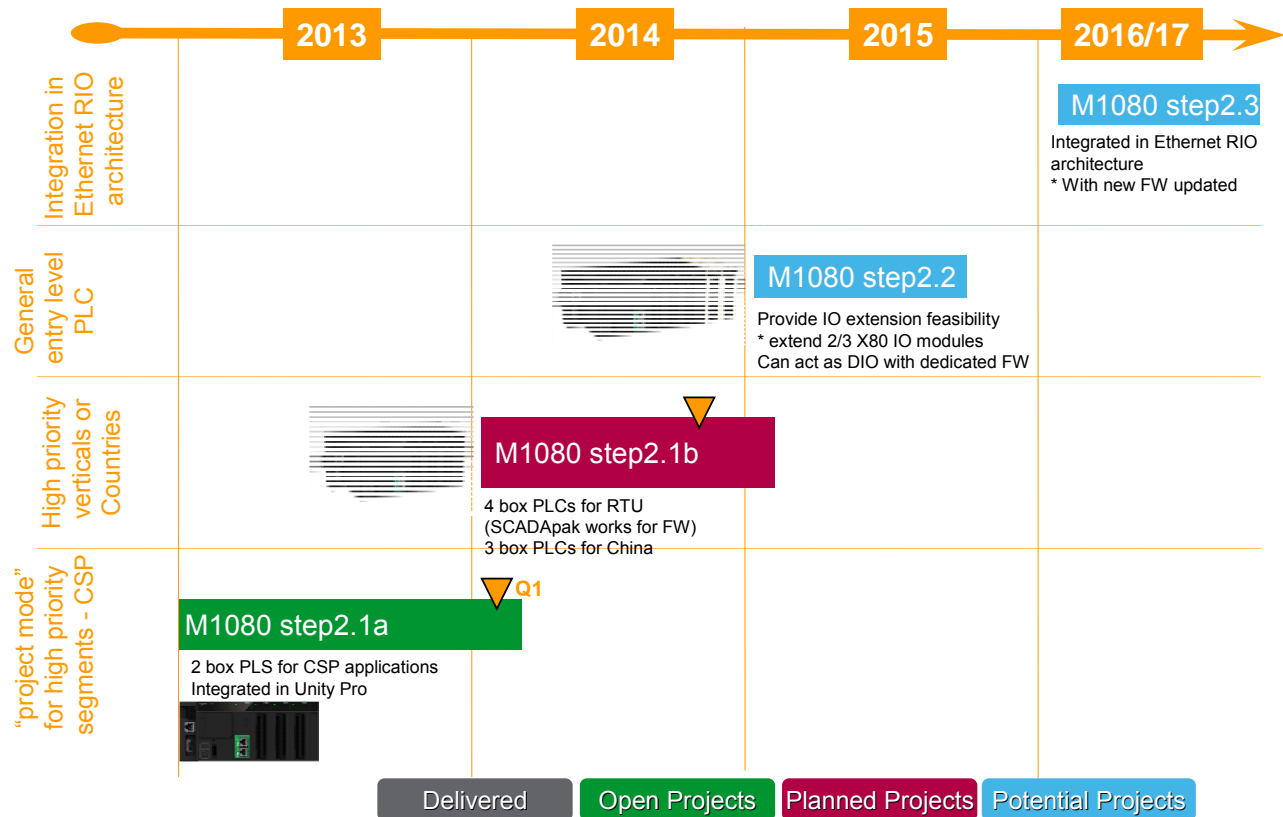
1.1.2 Objective:

- Provide simple control and IO
- Unity compliant
- Integrated into Plant Solutions architectures

MDI step2 offer is considered to delivery, via a “pragmatic”, step-wise approach (few references/YR), converging toward general purpose offer

- Step 2.1: “project mode” for high priority segments or applications, non-modular "box" technology, high volume low mix references, fast TTM
 - Step 2.1a: opportunities validated that we can already turn into PMP project
 - Step 2.1b: pipeline of opportunities to be validated
- Step 2.2: High priority verticals introduce modularity to increase flexibility
- Step 2.3: General purpose entry-level controller offer for EU totally integrated distributed intelligence

M1080 Roadmap



In MDI step 2.1a; our target is to deliver a controller offer for CSP (Concentrated Solar Power) application:

2 MARKETING REQUIREMENTS

The requirements stated in the current document are that of Control Activity - Plant Solution Marketing. Therefore, this is not intended as an engineering Product Specification or any other subsequent technical specifications, which will be developed at a later time. Rather, this document is an attempt to indicate those aspects that are user apparent, both physically and functionally, and will in all cases try to generalize needs as opposed to specify implementations except where warranted, such as in the case of Schneider Electric Invariants and other norms and standards.

2.1 Compliance and Conventions

In this document, the following words are used to define the significance of each particular requirement in accordance with IEC definition.

2.1.1 Requirements Terminology

A device implementation is not in compliance if it fails to satisfy one or more of the **Must** requirements. An implementation that satisfies all the **Must** requirements and all the **Should** recommendations is said to be "unconditionally compliant". One that satisfies all

the **Must** requirements but not all the **Should** recommendations is said to be "conditionally compliant".

"Must"

The word **Must** is used to indicate mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (**Must** equals IS REQUIRED TO).

"Should"

The word **Should** is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain course of action is deprecated but not prohibited (**Should** equals IS RECOMMENDED THAT).

"MAY"

The word **MAY** is used to indicate a course of action permissible within the limits of the standard (**MAY** equals IS PERMITTED TO). The word CAN is used for statements of possibility and capability, whether material, physical, or causal.

3 PROGRAM COMPLIANCE

[STR1] M1080 step2 offer Must be compliant with all SE standard, restriction and Program Requirements

Status: Negotiable = Must

[STR2] M1080 step2 offer Must be compliant with the all Plant solution standard, restriction and Program Requirements

Status: Negotiable = Must

4 MDI STEP 2.1A

The purpose of MDI step 2.1a offer is to provide 2 box PLCs with fixed IO to meet the requirement of CSP application/projects.

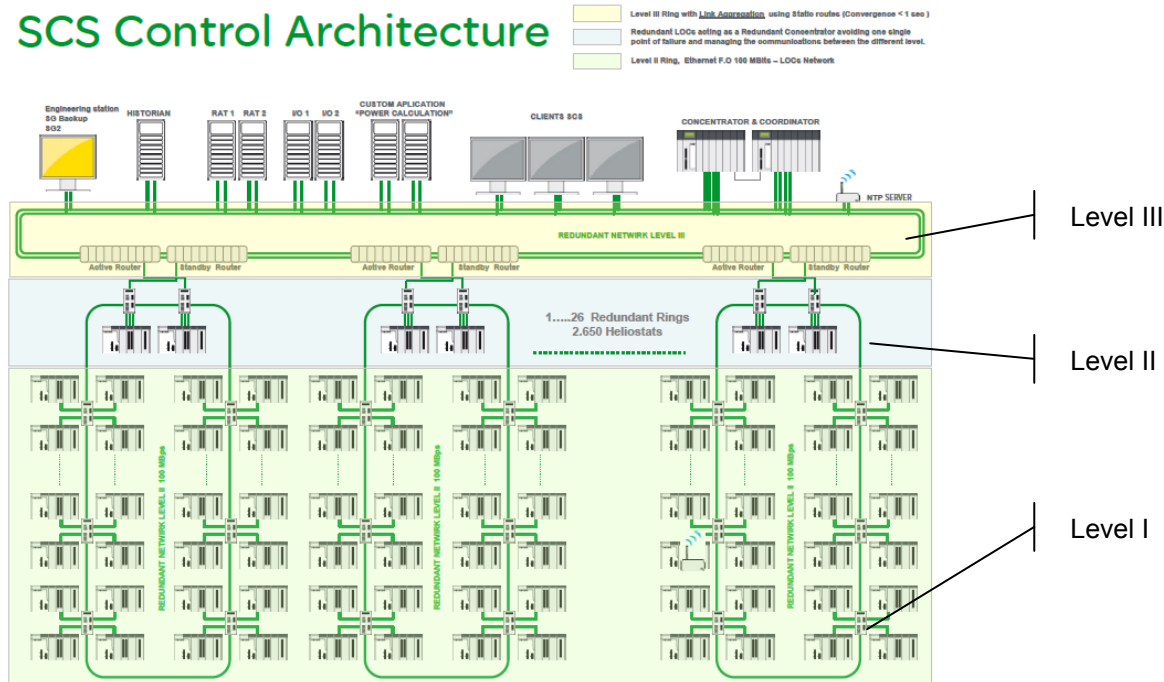
For more information regarding the project and current architecture of CSP projects, please refer to attached document.



successful CSP
project

4.1 Network topology

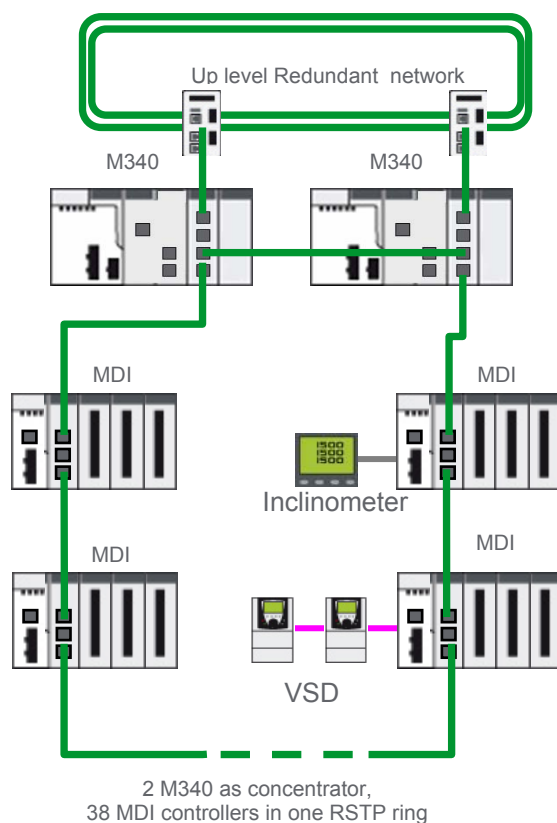
SCS Control Architecture



Current network architecture is constituted by three communication network levels. The total network convergence time should be less than 500 ms. M340 PLCs are placed in Level I communication with data concentrator (M340 PLC also) through Ethernet switch. Concentrators and Ethernet switches are in Level II as sub ring of Level III which is main ring of the system.

Customer requests to have all the cabinets connected in ring in order to simplify the installation. From the networking side, the challenge will be getting rid of the switches, which are too expensive in the cabinets.

The idea is to replace current M340 configuration with one MDI step 2.1a box PLC to control mirrors. M340 with NOC will be kept as concentrators,



See the M340 configuration below.

Reference	Description	Qty	Std Cost 2010 (€)
BMXCPS2010	STANDARD ISOL DC POWER SUPPLY	1	36.06
BMXXTSCPS10	POWER SUP SCREW CONNECTORS	1	2.29
BMXP3420302	CPU340-20 ETHERNET CANOPEN2	1	115.29
BMXEHC0200	HIGH SPEED COUNTER 2 CH	1	44.15
BMXXTSHSC20	HSC CONNECTOR KIT	1	9.27
BMXDDM16022	DIG 8I/8Q TRANS 0.5A	1	42.26
BMXFTB2020	SPRING TERMINAL STRIP 20 POINTS	2	3.6
BMXXBP0400	4 SLOTS BACKPLANE	1	29.25
BMXAMI0410	ANA 4 U/I IN ISOLATED HIGH SPEED	1	62.22
BMXRMS008MPF	MEM CARD 8MB FILES 16MB	1	8.39
Total			352.78

5 PRODUCT FEATURES & MARKETING REQUIREMENTS

This chapter lists all the required features, coming either from marketing or from internal constraints.

5.1 Commons requirements of M1080 step 2.1a

5.1.1 General requirement

[STR326] New references are created

[STR326.1] New reference of box1 (Non-analog input) is BMKC18332F

Status: Negotiable = Must

[STR326.2] New reference of box2 (with analog input) is BMKC18332F4M

Status: Negotiable = Must

[STR326.2] The product family is M1080.

Status: Negotiable = Must

Naming method

Segment	Symbol	BOX1	BOX2	Comment
Family	BMK	BMK	BMK	BMK means B asic M icro with K ampi bus
Range	C18	C18	C18	C: Compact P: Processor
Communication	x (0...4)	3	3	0: MB serial only 1: CANopen 2: Ethernet 3: Ethernet + CANopen 4: RIO compatible
Digital channel	xx	32	32	Number of Dig channels, EHC channels are also counted by Dig channels.
Digital type	Blank or R			Blank: Transistor R: Relay
HSC channel	Blank, M or F	F	F	F: Full function with reflect output, similar to EHC0200 M: Measurement without relect output, similar to EHC0800
Analog channel	Blank or x		4	Blank: no analog channel x: Number of analog channels
Analog type	Blank, M or H		M	H: 16bits, isolated by channels M: 16bits, blank: 12bits
Power supply	Blank or AC			Blank: 24 VDC AC: 120~230 VAC
Additional part	TBD			backup for other functionality such as Extension supports



Naming of M1080
V3.xls

[STR327] The short description

Status: Negotiable = Must

BMKPX832F0:

- In English: M1080 ETH CSP TYPE 1
- In French:

BMKPX832F4M:

- In English: M1080 ETH CSP TYPE2
- In French:

[STR328] The long description

Status: Negotiable = Must

BMKPX832F0:

- In English: M1080 TYPE 1 controller for CSP, 8 Dig in, 8 Dig out, 2 EHC, with dual Ethernet, 1 CANopen master and 1 Modbus serial master
- In French:

BMKPX832F4M:

- In English: M1080 TYPE 2 controller for CSP, 8 Dig in, 8 Dig out, 2 EHC, 4 Ana in, with dual Ethernet, 1 CANopen master and 1 Modbus serial master
- In French:

5.1.2 Architecture

Architecture is brick based, customer will receive a all-in-one box PLC, including CPU, power supply, embedded IO and embedded communication ports in one brick.

Extension will not be considered in step 2.1, but need to be included later, for instance, in step 2.2... Ideally, M1080 step2.2 needs to be able to extend X80 (M340) IO modules – e.g. 2-3 max., using a mini backplane extension.



[STR3] Architecture is based on a brick concept, meaning the brick is not modular

Status: Negotiable = Must

Each M1080 brick includes within the same housing a power supply unit, a CPU unit plus a set of functions and some communication ports.

For M1080 step2.1a: a mix of DI, DO, HSC, AI and some communication capabilities for the bricks

[STR4] Architecture has capability to support at least 4 IO boards and 1 communication board in the brick.

Status: Negotiable = Must

The maximum number of IO board supported in one brick for M1080 step 2.1a is 3, including DI/O board x1, AI board x1 and HSC board x1.

For M1080 step 2.1b, it's considered to support 2, 3, 4 I/O boards in the brick.

[STR5] A set of short rack allows extend at least 2 X80 (M340) IO modules

Status: Negotiable = MAY

The cost impact of the solution has to be as low as possible on non-extended configuration

Terminal resistor needs to be integrated in controller and small backplane. Remember to avoid using any additional accessories.

If cable and accessories are mandatory for technical reasons, they must be compatible with X80(M340).

[STR338] All controllers can be mounted on panel or 35mm Din-rail

Status: Negotiable = Must

5.1.3 Size

[STR6] Depth is not more than X80(M340) when mounting in a din-rail, see detail in below picture.

Status: Negotiable = Must

Ensure that M1080 can be used in same size cabinet as M340.

[STR7] Height is as same as X80(M340), 100 mm

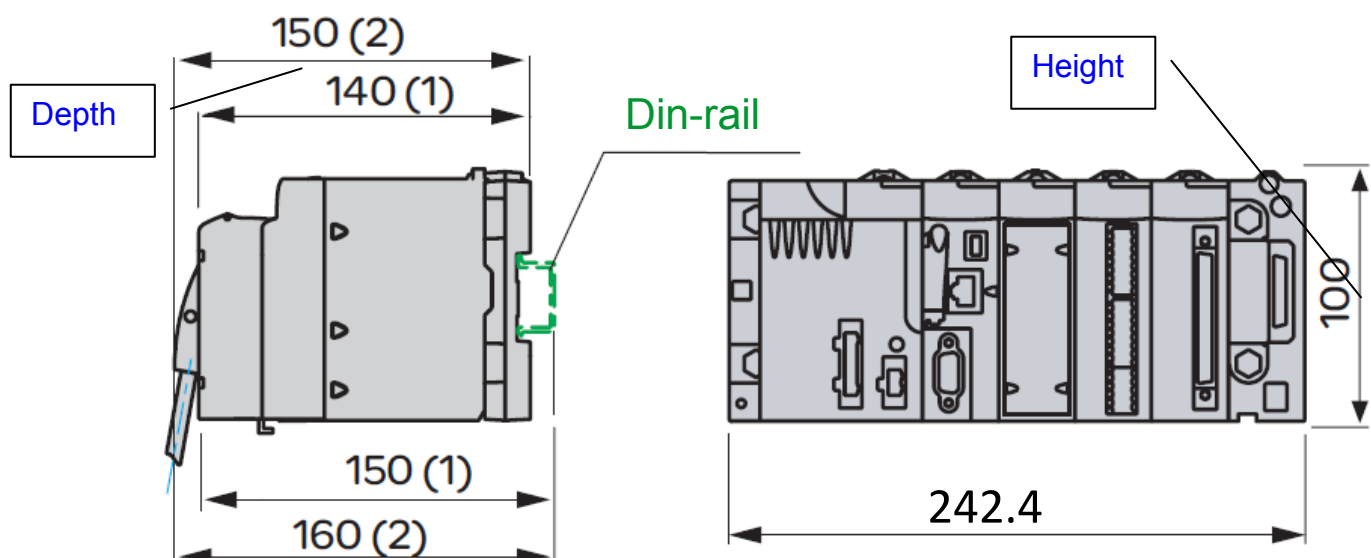
Status: Negotiable = Must

Align with M340 module height, to ensure no mechanical issue in the future, if we use X80(M340) IO as extension.

[STR8] Width is as small as possible, at least no more than 4 slot X80(M340) rack (BMXXBP0400), 242.4 mm

Status: Negotiable = Must

Same as depth, to ensure no replacement issue and reduce size of footprint.



Pic: 4 slots M340 rack dimension

Width

5.1.4 Labels

[STR9] The part number is readable when it is mounted

Status: Negotiable = Must

5.1.5 Visualization

[STR337] The operation status of PLC is indicated clearly

Status: Negotiable = Must

Show RUN, STOP and Error information of the controller.

[STR10] On each IO/communication board a led block provides enough information to make a standard diagnosis

Status: Negotiable = Must

The behavior of these indicator need to comply with M340 offer.

[STR11] Communication ports are indicated by different color following M580 standard

Status: Negotiable = Should

~~**[STR12] IO channels of different function (Digital channel, Analog channel, HSC channel) are indicated by different color following M580 standard**~~

~~Status: Negotiable = MAY~~

~~Below picture is WAGO IO, to show color of different channels.~~

5.1.6 Accessories

All necessary accessories for the wiring and the hardware setting of the PLC need to be reused from existing SE offer.

[STR13] BMXFTB2xx0 series terminal blocks can be used for M1080 IO connection

Status: Negotiable = Should

BMXFTB2xx0 offer includes 5 references, which are BMXFTB2000 (20-pin, cage clamp), BMXFTB2010(20-pin, Screw clamp), BMXFTB2020(20-pin, spring), BMXFTB2800(28-pin, cage clamp) and BMXFTB2820(28-pin, spring) and welcomed by customer.

We try to unify the terminal block to these offer, because

- They are sharing same dimension of hole in front panel, so that we can provide IO board flexibility for factory.
- Keep consistency with X80 range
- Simplify accessory package list

[STR14] Reuse existing shielding bar offer

Status: Negotiable = Must

[STR14.1] BMXXSP30x0 series shielding kits can be used for M1080.

Status: Negotiable = Should

Analyze result: impossible due to the length of backplane is different.

[STR14.2] STBXSP30x0 series shielding kits can be used for M1080.

Status: Negotiable = Must

STB shielding bar references are listed below.

Reference	Description
STBXSP3000	SHD KIT BRACKETS AND BAR
STBXSP3010	QTY10 SHD KIT SIZE 1 WIRE CLAMP
STBXSP3020	QTY10 SHD KIT SIZE 2 WIRE CLAMP

5.1.7 Power Supply

[STR15] Integrated DC Power Supply

Status: Negotiable = Must

24 Vdc Isolated Power Supply

[STR16] Provide at least 25 Watts power

Status: Negotiable = Must

[STR17] Support 24 VDC input

Status: Negotiable = Must

[STR18] Support 9~30 VDC input

Status: Negotiable = Should

9~30 Vdc Isolated Power Supply is required by RTU, one of major M1080 step2.1b candidates.

[STR19] Power supply for sensors is provided by the PLC

Status: Negotiable = Must

Number of input channels powered is limited to only in brick IO. That means 20 (8 + 12) discrete input channels (8 from dig in/out board, 12 from counting board) and 4 analog input channels for step2.1a, ~~and no more than 32 discrete input channels and 8 analog input channels for M1080 step2.1b.~~

In step2.1b, the limitation will be only in brick IO also, but the digital input channel may be 64 points, and Analog input channels may be 8.

[STR20] An "Alarm Relay" is available on all Power Supply

Status: Negotiable = May

Relay is a low power with 1 contact normally open. When the PLC is running without reported fault the output is set, when the application is stopped or if an internal fault occurs inside the power supply the contact is reset.

Need to analysis cost

[STR21] A RUN/STOP switch is provided in the front panel

Status: Negotiable = May

Customer can pause and resume the program; customer will get benefit from this behaviour during commissioning and debugging. Customer can operate this switch with bare hand or standard tool.

It's not required in CSP application, because customer will not do any maintenance in the field, they want to maintain all controller remotely.

This function is very useful for stand alone architecture, and it is available in competitors' offer, e.g. Siemens S7-300C and S7-1200. It's better to think about how to implement this function in step2.1b as stand alone is one of its target architecture.

Premium or M340 PLC offers the capability to use a Discrete Input as Run/Stop switch - (imply a fallback to 0 (Stop) when input is faulty).

We can decide whether keep same behavior depending on the workload.

[STR22] A RESET switch/button is provided in the front panel

Status: Negotiable = Must

Customer can reset the controller with a standard tool, such as a screwdriver.

5.1.8 Digital I/O

5.1.8.1 General Requirements

To cover the requirement of M1080 step 2.1a (CSP application), an equivalent offer as BMXDDM16022 is needed.

[STR23] Integrated digital I/O board: Dig 8 In 24 Vdc, 8 Out Trans Positive

Status: Negotiable = Must

Digital DC Inputs and Transistors Outputs Combination

- 8 IN Channels, 24 VDC, Sink logic, IEC Type 1
- 8 OUT Channels, 24 VDC 0.5 Amp, Source logic,
- Diagnosis and protection channel by channel
- 20 points terminal bloc

5.1.8.2 Wiring

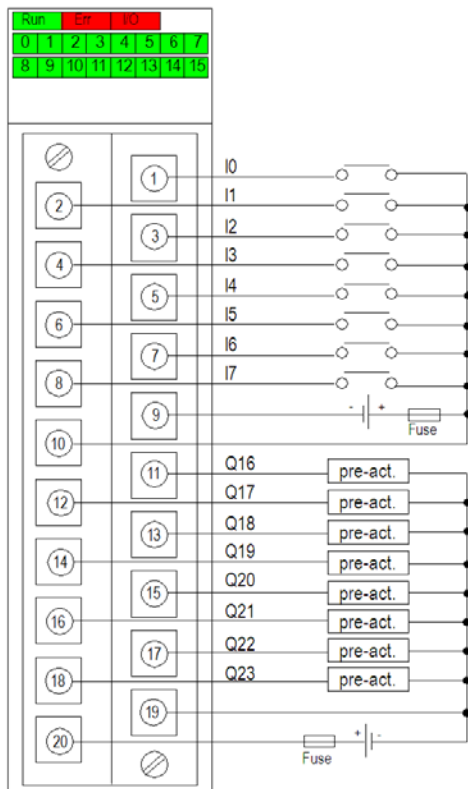
[STR24] Process terminal block has to be removable when process power is off

Status: Negotiable = Must

[STR25] Be compatible with BMXFTB20x0 terminal block

Status: Negotiable = Must

Can refer to wiring diagram of BMXDDM16022



5.1.8.3 In features

[STR26] loss of sensor power supply is detected and reported, this feature can be inhibited by configuration

Status: Negotiable = Must

Fault is always detected, when the feature is configured to be inhibited, only the diagnostic is cancelled, the internal treatment is always performed

~~**[STR27] pulse catch function is an accessible option**~~

~~Status: Negotiable = Should~~

~~Depending of the cost and technical feasibility.~~

M340 does not have this function.

[STR28] Digital inputs filter is proposed on all digital inputs channel

[STR28.2] fixed 4ms filter

Status: Negotiable = Must

[STR28.2] configurable filter (from 0 to 7 ms)

Status: Negotiable = Should

Configurable filter is preferred by some small OEM solution, they may work with upstream EU controllers like Quantum and need to be managed and programmed by Unity Pro.

[STR29] Except task setting, all parameters are changeable through on-line screen of Unity Pro

Status: Negotiable = Should

5.1.8.4 In Electrical interface

~~[STR30] No common shared between 2 connectors~~

~~Status: Negotiable = Must~~

[STR31] Digital input channels are compliant to IEC type 1.

Status: Negotiable = Must

[STR32] Digital input channels are compliant to IEC type3.

Status: Negotiable = Should

5.1.8.5 Out Features

[STR33] loss of pre-actuator power supply is detected and reported, this feature can be inhibited by configuration

Status: Negotiable = Must

[STR34] Fall back position is configurable

Status: Negotiable = Must

[STR35] Reactivation after disjunction is configurable

Status: Negotiable = Should

This function will be same as M340 discrete output channels.

Two modes for this parameter – Programmed and Automatic

Mode	Meaning
Programmed	Reactivation is executed with a command from the PLC application or through the appropriate debug screen. Remark: In order to avoid repeated reactivations, the module ensures an automatic 10s delay between two resets.
Automatic	The reactivation is executed automatically every 10s until the error disappears.

[STR36] Except task setting, all parameters are changeable through on-line screen of Unity Pro

Status: Negotiable = Should

5.1.8.6 Out Electrical interface

~~[STR37] No common shared between 2 connectors~~

~~Status: Negotiable = Must~~

[STR38] transistor output are protected against short circuit & overload channel by group

Status: Negotiable = Must

[STR39] transistor output are protected against short circuit & overload channel by channel

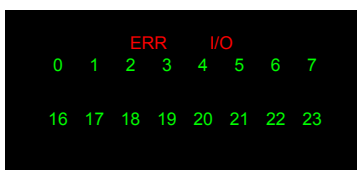
Status: Negotiable = Should
Depending of the cost and technical feasibility

[STR40] Digital Output channel can be configured as Digital input channel.

Status: Negotiable = MAY
Depending of the cost and technical feasibility

5.1.8.7 Visualization

When a voltage is present on an input or output, the corresponding LED is lit. Display of internal or external events is only effective once the module has been configured. After powering-up or a cold start, all the LEDs flash twice (for 2 seconds) to show that the module is operational. When an event is detected, the channel status is recorded until the cause of the event is cleared



State of DIG board		LEDs	
		ERR (red)	I/O (red)
Normal operation		OFF	OFF
Internal events	Module analysis needed	ON	OFF
	CPU communication interruption	Flashing	OFF
External events	Overload, short circuit, sensor/pre-actuator voltage error	OFF	ON
Configuration	Self-test at start-up	Flashing	Flashing
	Not configured	Flashing	OFF

It's just a proposal basing on behavior of X80 DIO modules, it needs to be refined in PS.

5.1.9 Analog I/O

5.1.9.1 General Requirements

[STR41] Industrial class product for analog input

Status: Negotiable = Must

Industrial class: Max inaccuracy 0.2% (Ideally 0.1%) over the temperature range, resolution of all ranges greater than 14 bits

This feature is indentical to BMXAMI0410,

- 0.2% up to 70 centigrade for voltage input,
- 0.55% up to 70 centigrade for cuurent input.

[STR42] 4 Analog input channels are integrated

Status: Negotiable = Must

- ~~• 4 multi range (U & I) channels (Typically 0-10V, +/- 10 V, 4/20 mA ...)~~
- ~~• high speed (Typically 4 ms per 4 channel), high resolution (14 to 16 bits)~~

5.1.9.2 Electrical characteristics

[STR43] Same channel can be configured either in current or voltage

Status: Negotiable = Must

[STR43.1] multi-range voltage input

Status: Negotiable = Should

Typical range: +/-10 V; +/-5 V; 0...10 V; 0...5 V; 1...5 V

[STR43.2] multi-range current input

Typical range: 0...20 mA; 4...20 mA; +/- 20 mA. 4...20mA is mandatory for CSP application, typically, they use transmitter to adjust all analog input to 4..20mA signal

[STR43.2.1] 4...20mA

Status: Negotiable = Must

[STR43.2.2] 0...20mA

Status: Negotiable = Should

[STR43.2.3] +/-20mA

Status: Negotiable = Should

~~**[STR44] Support of a low common mode between channels**~~

~~Status: Negotiable = Should~~

[STR45] Sampling time

[STR45.1] Fast input, fast input means 1ms per channel

Status: Negotiable = Should

Fast means less than 5 ms for 4 active channels. Normally for fast input is 1 ms for sampling reference + 1ms per channel

[STR45.1] Normal input, 10ms per channel

Status: Negotiable = Must

5.1.9.3 Analog Input value processing

[STR46] Input range selection is configurable by Unity Pro

Status: Negotiable = Must

[STR47] Numeric filtering is configurable by Unity Pro

Status: Negotiable = Should

[STR48] Scaling is configurable by Unity Pro

Status: Negotiable = Should

[STR49] Out of range detection is configurable by Unity Pro

Status: Negotiable = Should

[STR50] Isolated between logic and I/Os

Status: Negotiable = Must

- Between channels and bus 1400 VDC
- Between channels and ground 1400 VDC

[STR51] Isolated between channels (+/-300 VDC)

Status: Negotiable = Should

[STR53] Analog channel is compatible with BMXFTB20x0 terminal blocks.

Status: Negotiable = Must

5.1.9.4 Analog Input maintenance and adjust services

[STR52] Auto-calibration is performed for analog input channel, and it is invisible to customer

Status: Negotiable = Must

Today for high level analog input the current M340 modules are including auto-calibration (Very appreciate by customer).

It's complex to implement customer calibration function. and it's only for output, using in factory.

~~**[STR53] Sensor alignment is configurable trough dedicated maintenance screens**~~

~~Status: Negotiable = Should~~

[STR54] Forcing is performed through Ethernet

Status: Negotiable = Should

Online adjust screen is preferred.

Check whether Analog channel can support forcing or not.

Normally in Animation table, variable in program and debug screen.

5.1.9.5 Common

[STR55] Value representation compliant with recommendation of IDS3000

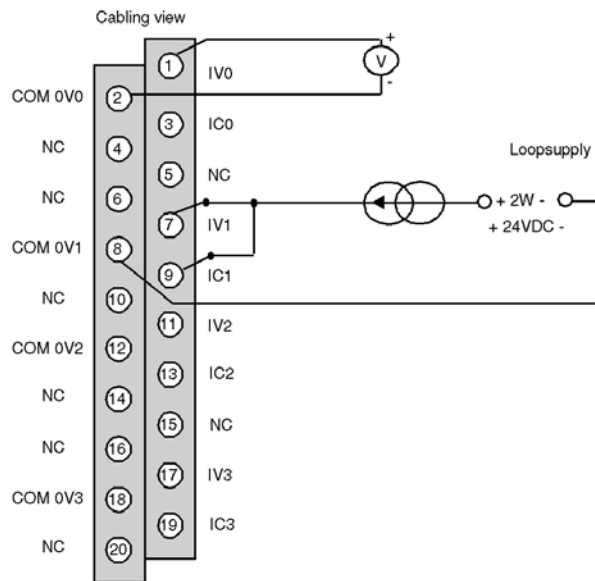
Status: Negotiable = Must

Normalized format for High Level inputs & outputs (0/10000 or +/- 10000),
Normalized or physical for temperature inputs (°C or °F by step of 0.1°)

[STR56] Analog channel is compatible with BMXFTB20x0 terminal blocks.

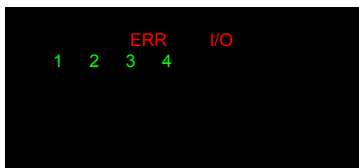
Status: Negotiable = Must

Same wiring diagram as BMXAMI0410



~~[STR57] Except task setting, all parameters are changeable through on-line screen of the programming terminal~~
~~Status: Negotiable – Should~~
 Check which parameter can change
 M340 does not support

5.1.9.6 Visualization



Module status	Status LEDs		
	ERR	I/O	IN channel
Operating normally	OFF	OFF	ON
Module is running with channels in stopped state	OFF	OFF	OFF
Module is inoperative or switched off	OFF	OFF	OFF
Module not configured or channel configuration in progress	OFF	OFF	OFF
Internal error in module	ON	OFF	OFF
Not configured	Flashing	OFF	OFF
Range under/overflow error	OFF	ON	Flashing
Sensor link error	OFF	ON	Rapid flashing

Note: Visualization proposal is following X80 analog IO standard, can be modified and decided in PS.

5.1.10 Counting

5.1.10.1 General Requirements

Customer requires an equivalent HSC function as BMXEHC0200, so it's safe to keep all BMXEHC0200 features in MDI step 2.1a controller.

[STR58] High Speed Generic Counter 2 Channel module

Status: Negotiable = Must

[STR59] HSC board offers 6 Inputs and 2 outputs per channel

Status: Negotiable = Must

Compatibility with incremental encoders:

3 fast inputs for coders interface + 3 standards inputs for Preset Enabled and Hold
2 reflex outputs

[STR60] Counting depth is 32 bits

Status: Negotiable = Must

[STR61] Max Frequency is 60 KHz

Status: Negotiable = Must

[STR62] Wiring has to be simple and standard

Status: Negotiable = Must

Prefer to use BMXFTB20x0 or BMXFTB28x0 terminal block, if possible.

Otherwise, BMXXTSHSC20 is also acceptable.

[STR63] HSC board can use BMXFTB20x0 or BMXFTB28x0 terminal block for wiring

Status: Negotiable = Should

In order to keep consistent of outlook and form factor for M1080

5.1.10.2

In Electrical interface

[STR64] Inputs are 24 V Sink/Source IEC Type 1

Status: Negotiable = Must

[STR65] Inputs are 24 V Sink/Source IEC Type 3

Status: Negotiable = Should

[STR66] Module monitor sensor (Input & Encoder) power supply

Status: Negotiable = Must

5.1.10.3

In Features

[STR67] A configurable filter is provided for all inputs

Status: Negotiable = Should

Depending of his frequency range the user can select an appropriate filter.

To avoid design risk, we can reuse TWDHSC200 as much as possible, as TWDHSC200 can be regarded as a kampi BMXEHC0200.

Filtering level	Input	Maximum delay	Minimum pulse	Maximum frequency
None	IN_A, IN_B	-	5 μ s	60 KHz
	IN_SYNC	-	5 μ s	200 Hz
	IN_EN	50 μ s	-	-
	IN_CAP, IN_REF	-	50 μ s	200 Hz
Low for bounces > 2 KHz	IN_A, IN_B	-	450 μ s	1 KHz
	IN_EN	450 μ s	-	-
	IN_SYNC, IN_CAP, IN_REF	-	500 μ s	200 Hz
Resource for bounces > 1 KHz	IN_A, IN_B	-	1.25 ms	350 Hz
	IN_EN	1.25 ms	-	-
	IN_SYNC, IN_CAP, IN_REF	-	1.25 ms	200 Hz
High for bounces > 250 Hz	IN_A, IN_B	-	4.2 ms	100 Hz
	IN_EN	4.2 ms	-	-
	IN_SYNC, IN_CAP, IN_REF	-	4.2 ms	100 Hz

[STR68] Selection of the 3 standards quadrature mode (X1, X2, X4) is configurable

Status: Negotiable = Must

[STR69] Enhanced functions (Slack corrector, sophisticated homing, ...)

Status: Negotiable = May

5.1.10.4

Counting Features

[STR70] Scaling and calibration features are available on all inputs depending of the configured function

Status: Negotiable = Should

[STR71] Different modes of the counting function are configurable

[STR71.1] One shot counting

Status: Negotiable = Must

[STR71.2] Modulo or loop counting

Status: Negotiable = Must

[STR71.3] Up and down counter (Accumulator)

Status: Negotiable = Must

[STR72] Different modes of the frequency measurement function are configurable

[STR72.1] Frequency meter

Status: Negotiable = Must

[STR72.2] Event counting

Status: Negotiable = Must

[STR72.3] Period measurement

Status: Negotiable = Should

[STR72.4] Ratio meter

Status: Negotiable = Should

[STR73] Different modes of the Pulse Width Modulation function are configurable

Status: Negotiable = Should

[STR74] 2 capture register are triggered in different configurable modes

Status: Negotiable = Must

[STR75] 2 Threshold are managed in the different modes

Status: Negotiable = Must

5.1.10.5

Out Electrical interface

[STR76] Outputs are transistor type, source and protected against overload & short circuit

Status: Negotiable = Must

[STR77] IO board monitors actuator power supply

Status: Negotiable = Must

5.1.10.6

Out Features

[STR78] Latch features behavior is configurable

Status: Negotiable = Must

[STR79] Fall back position is configurable

Status: Negotiable = Must

5.1.10.7

Visualization

The led diagnostic below is a proposal basing on BMXEHC0200 module. It can be changed and refined in PS.



Module status	LED indicators									
	ERR	IO	IA	IB	IS	IE	IP	IC	Q0	Q1
The module is faulty or switched off	○									
The module has a fault	●									
The module is not configured	▲	○								
The module has lost communication	▲									
The sensors have a supply fault	○	●	★							
The actuators have a supply fault	○	●							★	
Short circuit on output Q0	○	●							▲	
Short circuit on output Q1	○	●								▲
The channels are operational	○	○								
The voltage is present at output Q0	○	○								
The voltage is present at output Q1	○	○								

The voltage is present at input IN_A	○	○	●							
The voltage is present at input IN_B	○	○		●						
The voltage is present at input IN_SYNC	○	○			●					
The voltage is present at input IN_EN	○	○				●				
The voltage is present at input IN_REF	○	○					●			
The voltage is present at input IN_CAP	○	○						●		

Legend

● LED on

○ LED off

★ LED flashing slowly

▲ LED flashing fast

An empty cell indicates that the state of the LED(s) is not taken into account

5.1.11 Safety

Nothing specific is required for M1080.

5.1.12 Agency**5.1.12.1 Agency Approvals**

In this part, the idea is to comply to all existing standards and certifications for X80(M340).

In the following cases, standard conformity certificate as to be issued by the relevant official organization and the products Must carry the approval symbols when enforced.

5.1.12.1.1 Community regulation and certification body approval are requested for several countries:**[STR80] Whole range is CE Marked**

Status: Negotiable = Must

It's a legal constraint for sales in European countries

[STR81] Whole range is UL certified

Status: Negotiable = Must

It's a legal constraint for sales in the U.S.A.

[STR82] Whole range is CSA certified

Status: Negotiable = Must

It's a legal constraint for sales in Canada

[STR83] Whole range is C-Tick certified

Status: Negotiable = Must

It's a legal constraint for sales in the Australia

[STR84] Whole range is Gost certified

Status: Negotiable = Should

It's a legal constraint for sales in Russia

5.1.12.1.2 In order to target certain industries in North America or in Europe the range as to be certified for hazardous locations:

[STR85] Whole range is FM Clas1 Div 2 certified

Status: Negotiable = Should

[STR86] Whole range is CSA Clas1 Div 2 certified

Status: Negotiable = Should

[STR87] Whole range is UL Clas1 Div 2 certified

Status: Negotiable = Should

[STR88] Whole range is ATEX Zone 2 certified

Status: Negotiable = May

Quantum and M340 range got ATEX certifications in 2012.

5.1.12.1.3 In order to allow use on board of merchant navy vessels, the following certifications are required:

[STR89] Whole range is BV certified by the Bureau Veritas (France)

Status: Negotiable = Should

[STR90] Whole range is DNV certified by Det Norske Veritas (Norway)

Status: Negotiable = Should

[STR91] Whole range is GL certified by Germanischer Lloyd (Germany)

Status: Negotiable = Should

[STR92] Whole range is LR certified by Lloyd's register (United-Kingdom)

Status: Negotiable = Should

[STR93] Whole range is ABS certified by American Bureau of Shipping (USA)

Status: Negotiable = Should

[STR94] Whole range is RINA certified by Registro Italiano Navale (Italy)

Status: Negotiable = May

[STR95] 4 Whole range is RRS certified by Register of Shipping (C.I.S.)

Status: Negotiable = May

5.1.12.2 Standard Compliance

Even if the certification by the relevant certification body or the classification authority is not required, the standards that have to be taken into account are the following:

[STR96] Whole range is designed compliantly to Merchant Navy standards and rules

Status: Negotiable = Must

Complete list of standards and rules with their edition date is provided separately to this document.

[STR97] Whole range is designed compliantly to the Low Voltage directive requirements

Status: Negotiable = Must

Applicable standard is EN61131-2:2003 (published on Feb, 1st 2004).

73/23/EEC amended by 93/68/EEC

[STR98] Whole range is designed compliantly to the Electromagnetic Compatibility directive requirements

Status: Negotiable = Must

Applicable standard is EN61131-2:2003 (published on Feb, 1st 2004).

89/336/EEC amended by 92/31/EEC and 93/68/EEC

[STR99] Whole range is designed compliantly to UL requirements

Status: Negotiable = Must

Applicable standard is UL508 17th edition

[STR100] Whole range is designed compliantly to CSA requirements

Status: Negotiable = Must

Applicable standard is CSA C22.2No142:M2000

[STR101] Whole range is designed in compliance with FM Clas1 Div 2 requirements

Status: Negotiable = Should

[STR102] Whole range is designed in compliance with CSA Clas1 Div 2 requirements

Status: Negotiable = Should

Applicable standard is C22.2 No. 213-M1987 (R2004)

[STR103] Whole range is designed in compliance with UL Clas I Div 2 requirements

Status: Negotiable = Should

Applicable standard is UL 1604, Electrical Equipment for use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations

[STR104] Whole range is designed in compliance with ATEX Zone 2 requirements

Status: Negotiable = May

Quantum and M340 range got ATEX certifications in 2012.

5.1.12.3 Environmental constraints

- 5.1.12.3.1 Feedback on installed base pushed us to reach level higher than specified by the international standard on the following points:

[STR105] Whole range is operating within the range of 0 to 60 degrees Celsius.

Status: Negotiable = Must

Range (0 - 60) exceeds Standard requirements, but is a feature clearly valuable in lot of areas and provided by majority of the competition.

[STR106] Whole range is operating within the range of 60 to 70 degrees Celsius.

Status: Negotiable = Must

Range (0-70) is required by CSP application, the major target of MDI step2.1a controller.

Reasonable de-rating is acceptable.

[STR107] Whole range is operating within the range of -25 to 0 degrees Celsius.

Status: Negotiable = Should

Reasonable de-rating is acceptable.

[STR108] Whole range is operating at an altitude between 2000 and 4000 meters.

Status: Negotiable = May

Correction factor for 4000m is 1.29, applied to all clearance and creepage distances. This means that the product can operate without degrading safety protection.

Reasonable de-rating is acceptable.

[STR109] Whole range is operating with a high level of mechanical constraints

Status: Negotiable = Must

For panel mounted configuration the targeted level is the strongest proposed by SE experts if material cost is not impacted by more than 2%; this level is called 3M8 in the IEC 60721-1.

Otherwise the level to reach is this just below, it's the 3M7 in the IEC 60721-1

	Vibrations IEC60068-2-6	Chocks IEC60068-2-27
Minimum	10mm/3g/x10	30g/11ms/x3
Target if Cost Impact <2%	15mm/5g/x10	50g/11ms/x3

Lower level is acceptable when the PLC is mounted on DIN rail

[STR110] Whole range is operating in a corrosive atmosphere

Status: Negotiable = Should

The target is the level defined as 3C3 in the IEC 60721-1 if material cost is not significantly impacted, otherwise levels defined as 3C2 is acceptable. Evaluations can be performed according

the 4 gazs (IEC 60068-2-60 non coated boards - 21 days) method plus 5% NaCl 35 °C - 4 days non operating.

[STR111] Whole range is operating in a dusty atmosphere

Status: Negotiable = Should

The target is the level defined as 3S2 in the IEC 60721-1

M1080 also may be compliant with CEI68260 (IEC60721-3-3) and ISA-S71,04-1985 (G3 severity) with conformal coated version.

5.1.12.3.2 Whole range has equally to comply with SE Eco design directives. (NEW2004 initiatives):

[STR112] Whole range complies with European ROHS regulation and not contains lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominatedethers.

Status: Negotiable = Must

[STR113] Whole range complies with SE requirement for reduced product energy consumption during manufacture and use.

Status: Negotiable = Must

[STR114] Whole range generates the least possible waste at the end of the product's useful life.

Status: Negotiable = Must

5.1.13 Performances

[STR115] Maximum starting time of the whole PLC is shorter than 20 seconds

Status: Negotiable = Must

It's not directly required by customer, but it does not make sense to have a longer starting time than bigger controller like M340 or Quantum.

[STR116] Maximum starting time of the whole PLC is shorter than 10 seconds

Status: Negotiable = Should

[STR117] Maximum starting time of the whole PLC is shorter than 5 seconds

Status: Negotiable = May

5.1.14 Constraints

5.1.14.1 Compatibility with other Unity platforms

[STR118] Support all Unity languages, except LL984

[STR118.1] Support ST Language

Status: Negotiable = Must

[STR118.2] Support FBD Language

Status: Negotiable = Must

ST and FBD are used in Gemasolar application, and CSP expert confirm to use them further.

[STR118.3] Support IL Language

Status: Negotiable = Should

[STR118.4] Support LD Language

Status: Negotiable = Should

IL and LD are used widely in small applications, which are MDI target.

[STR118.5] Support SFC Language

Status: Negotiable = Should

Normally, SFC is for process management of machine. It's not MDI target.

5.1.14.2 Future Extensions

[STR119] Capability to connect a optimized X80 rack containing Digital, Analog, Counters X80 modules

Status: Negotiable = May

Do not need to support advanced modules, include

- High density I/O modules, like 32/64 points Digital or 16 points Analog IO modules.
- NOM, NOE, NOC, NOR and other communication modules.
- Expert modules, like EHC and ERT (time stamping) modules
- 3rd party modules, like wireless, weighing modules

[STR120] Capability to create an extended temperature version based on this design

Status: Negotiable = Should

Extended temperature means -25°C to 70°C

[STR121] Capability to create a conformal coated version based on this design

Status: Negotiable = Should

If can not meet STR 110 and 111 with standard version, then we may need conformal coated version for some application with severe environment.

Conformal coated version is required in RTU application, which is a major candidate of MDI step2.1b.

5.1.14.3 Target Manufacturing Cost (CGS)

The economical analysis detailed is based on the following hypothesis:

[STR122] Targeted manufacturing cost is 150 €for BOX1 (non analog controller)

Status: Negotiable = Must

[STR123] Targeted manufacturing cost for BOX2 (with analog controller)

[STR123.1] manufacturing cost is 180 €

Status: Negotiable = Must

[STR123.2] manufacturing cost is 150 €

Status: Negotiable = Should

We have two major customers of CSP, Sener and Albengoa, they use different technologies.

- Sener is the major target of M1080 step2.1a. They choose Ethernet technology. They use M340 controller in the applications that it's not cost sensitive, and OEM controllers (M258 or M238) in cost sensitive projects.
- Alengoa use Tevent solution (Falcon product) now. That's very cost effective. As Tevent has the willing to migrate to M1080, we don't want that price will prevent adoption by Telvent of M1080.

Current Telvent Falcon catalog for reference:



Cutsheet
Falcon-EN-Rev1. 2.

5.2 CPU

5.2.1 Catalogue

[STR124] M1080 (CPU) is declined in 2 part numbers depending of embedded IO boards

Status: Negotiable = Must

Each M1080 has 2 Ethernet port (1 MAC address), 1 Modbus Serial port, 1 CANopen port, 1 USB port, 1 SD card slot(maybe), embedded DC power supply and CPU.

- BOX1 has 8DI, 8DO, 2HSC, mainly for CSP tower application
- BOX2 has 8DI, 8DO, 2HSC and 4AI , mainly for CSP parabolic application

5.2.2 Application excution performance

Excution performance!

Check M340 or MDI step1 PS

Target application cycle time is less than 20ms. Current Gemasolar application is running on BMXP3420302 CPU, and the cycle time is about 12ms with a 6ms fast task. If we assign all fast task section to Mast task, the cycle time reduce a little.



cycle time for
Gemasolar applica

[STR329] Cycle time is less than 20ms, when similar application as Gemasolar is executed

Status: Negotiable = Must

Now, the user application executive speed of Spear 320 processor is faster than M340 CPU, but the Kampi bus and communication will also impact the performance.

5.2.3 Memory Application program

[STR330] Memory size

[STR330.1] Maximum User Application memory size (Program + data) is not less than 128Kbytes

Status: Negotiable = Must

[STR330.2] Maximum saved data is not less than 2048Kbytes

Status: Negotiable = Must

STR330 base on two preconditions

1. The efficiency of converting code to memory address for M1080 is equivalent or better than M340.
2. CSP applications are similar, Gemasolar usage plus 30% buffer is enough.

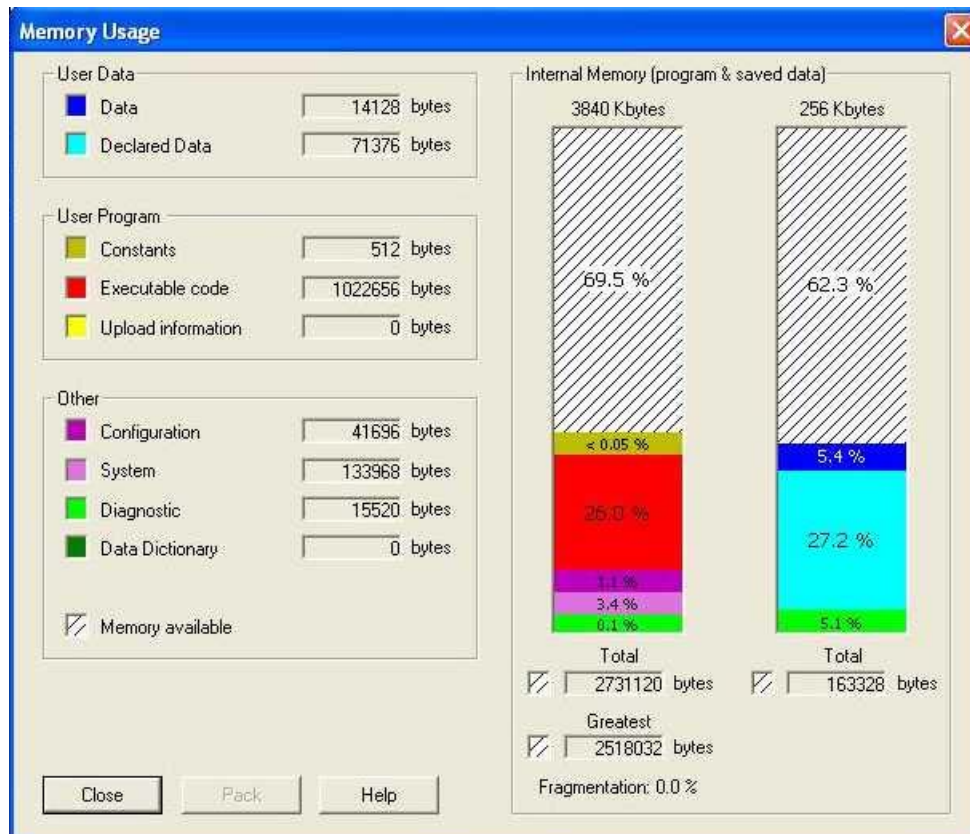
Below are memory usages of Gemasolar application.

1. Original spared saved data size is 101Kbytes. That means 155Kbytes is used.
2. After optimization, spared saved data size is 163Kbytes. That means 93Kbytes is used. The optimization actions include purging unused variables and

FB instances, reassigning %MW address to user-defined type variables (array, struct).



Pic 5-1 Loc type1 memory usage before optimization



Pic 5-2 Loc type1 memory usage after optimization

[STR125] Download from Unity (Unity Pro & Unity Loader) to the PLC trough local connection or network

Status: Negotiable = Must

Download of the application has to be fast and reliable whatever the communication link, either a local programming port of the CPU or a Network. Ideal time is less than 5 minutes for the bigger application. The application download has to be possible on a non-configured CPU.

Normally, download speed via terminal is faster than Ethernet download. For CSP application, application download will be taken with Ethernet, we need to focus on improve the performance of Ethernet application download.

5 minutes is very basic requirement, target is less than 2 minutes.

[STR126] Upload from the CPU to Unity (Unity Pro & Unity Loader) trough local connection or network

Status: Negotiable = Must

Upload of the application is performed at the same medium speed as the download then Unity has to "rebuild" the application. Ideal time to recover the application is less than 5 minutes for the bigger application.

[STR127] Modification "adjust parameter" for HSC channels from Unity Pro online screen

Status: Negotiable = Must

On line changes are performed like on M340 Unity. The changes affect the execution memory, and backup permanently stored in the CPU automatically.

[STR128] Backup in the PLC on user order PLC in RUN or STOP

Status: Negotiable = Should

At any time the user connected with Unity Pro can launch a copy of the application currently stored in the execution memory into a retentive memory (for example an SD card).

[STR129] Restore from the PLC backup after each power on or reset

Status: Negotiable = Must

After power on or reset the system copies the application stored in a retentive memory (for example an SD card) into the execution memory.

[STR130] Restore from the PLC backup on user order

Status: Negotiable = Should

At any time the user connected with Unity Pro can launch a copy of the application stored in a retentive memory (for example an SD card) into the execution memory.

[STR131] Download to the PLC without Unity loader

Status: Negotiable = Must

This feature can be realized by

- sending an SD card programmed with the application
- providing a downloading tool independent of the Unity Pro that the OEM can send with the application using a standard tool of the market
- Using MSU or SG2, see details below

[STR132] Capability to support MSU (massive software upgrade)

Status: Negotiable = Should

MSU function may include different levels

1. User application program
 - a) Check user application program version
 - b) Upgrade user application program
2. PLC firmware
 - a) Check CPU/IO board FW version
 - b) upgrade CPU/IO board FW
3. Store/restore user-defined parameter (IP adress, I/O configuration, etc.)
 - a) Customer can store PLC parameter and may modify the parameters offline.
 - b) Customer can update PLC parameters easily with restore function

This feature can help customer to upgrade thousands of PLC software in a short time (short time means not more than 1 hours for 6 thousands PLC??)

Main contactor in AOCl: Saurav Agrawal, Marketing project leader of MSU

[STR331] Capability to support SG2 and SG backup

Status: Negotiable = Must

These tools were used for Gemasolar application. Now SG2 and SG backup are official released.

Here is SGBackup introduction.



SGBackup

And you can get sg2 via this link

sg2 V3.6 SP2

http://www.schneiderelectric.es/spain/es/productos-servicios/automatizacion-control/descarga/descarga-documentos-iframe.page?URL=http://www.downloads.schneider-electric.com/sites/oreo/es/document-list.page?p_Conf=i%26p=2257%26c=41

5.2.3.1 Application data

[STR133] Restore from Unity Pro to the PLC trough local connection or network

Status: Negotiable = Should

At any time the user connected with Unity Pro can update all the data currently used in the execution memory with the data previously stored into a file of his Unity Pro.

[STR134] Save from the CPU into Unity Pro trough local connection or network

Status: Negotiable = Should

At any time the user connected with Unity Pro can launch a copy of all the data currently used in the execution memory into a file of his Unity Pro.

[STR135] Backup in the PLC before each power off

Status: Negotiable = Must

When power off occurs, the system copies the application data and system data used in the execution memory into a retentive memory ~~(for example a memory card)~~.

[STR136] Restore from the PLC backup after each power on

Status: Negotiable = Must

After power on or reset the system copies the application data and system data previously stored in a retentive memory ~~(for example a memory card)~~ into the execution memory.

5.2.3.2 Data storage

This brings the capability to manage files inside the cartridge through the PLC program and transfer the files to or from the cartridge to a computer in a simple way. It allows customers to store recipes, to log information from production and retrieve the information that are used at the IT level.

[STR137] Restore from the Unity Pro to the PLC trough local connection or network

Status: Negotiable = Must

At any time the user connected with Unity Pro can transfer Data Storage information from a file of his Unity Pro into the PLC.

[STR138] Save from the CPU into Unity Pro trough local connection or network

Status: Negotiable = Must

At any time the user connected with Unity Pro can transfer Data Storage information from the PLC into a file of his Unity Pro.

[STR139] Send from a standard tool to the PLC trough local connection or network

Status: Negotiable = Should

At any time the user connected on the programming port or on a Network can transfer Data Storage information from a file of his terminal into the PLC with a standard tool (Typically a FTP client or a WEB browser)

[STR140] Get from the CPU to a standard tool trough local connection or network

Status: Negotiable = Should

At any time the user connected on the programming port or on a Network can transfer Data Storage information from the PLC into a file of his terminal with a standard tool (Typically a FTP client or a WEB browser)

5.2.3.3 Full access by the Application program

A set of Function Bloc allows the user to manage the Data Storage blocs of information and to read, write and modify their content.

[STR141] Transfer from a faulty PLC to a new one

Status: Negotiable = Should

The need concerns a fast an efficient way to reload the Data Storage information into a new CPU after changing a faulty one.

For example remove an SD card out of the faulty CPU and re-plug it into the new CPU. If no SD card support, this function will be not applicable.

[STR142] Each files can be protected from external access (No access, Read only, Read/Write, Read/Write/Erase)

Status: Negotiable = Should

The requested features are similar to the basic services of all standard file system.

5.2.4 CPU firmware

[STR332] SD card support

Status: Negotiable = Should

Not clear if the use of SD card is mandatory to recover power outage like M340, or if it is optional like M580 (backup in internal flash and SD card if present).

SD card is mandatory in M340 CPU for Vxwork support, but it seems we have different mechanism to avoid using SD card, so that for MDI step2.1a, no SD card support is also a good option.

[STR143] Fast and reliable update from the Unity Loader to the PLC trough local connection

Status: Negotiable = Must

Fast is less than 5 minutes

Reliable means:

No known case of unexpected abort

Customer can update firmware for M1080 PLC with a normal version of Unity Loader.

Customer will see only one firmware for the controller, and this FW contains FW for CPU, IO boards, Communication, etc.
CPU FW, AIO board FW, DIO board FW, HSC FW and others are invisible to customer.

Capability to restart the update if an unexpected event occurs (Power off or cable disconnection)

[STR144] Fast and reliable update from the Unity Loader to the PLC trough a network

Status: Negotiable = Must

Same request as the STR143 but using a Unity Loader connected to a network

~~**[STR145] Fast and reliable update without Schneider software**~~

~~Status: Negotiable = May~~

~~Typical use is when an OEM wants to upgrade a machine already sent to the end user who don't owned the programming software and when this application update implies a firmware update (For compatibility reasons for example).~~

~~This feature can be realized either by~~

- ~~• sending a memory card containing the PLC firmware~~
- ~~• using a standard tool of the market~~

[STR146] Possible password to authorize or deny update access

Status: Negotiable = Should

[STR147] Impact of a firmware update on the CPU versioning is compliant with published rules

Status: Negotiable = Must

~~**[STR148] Backup System data in the PLC before each power off**~~

~~Status: Negotiable = Must~~

~~When power off occurs, the system copies the system data used in the execution memory into a retentive memory (for example a memory card).~~

~~**System data will be stored with application data, so this STR is duplicated with STR135**~~

~~**[STR149] Restore System data from the PLC backup after each power on**~~

~~Status: Negotiable = Must~~

~~After power on or reset the system copies the system data previously stored in a retentive memory (for example a memory card) into the execution memory.~~

~~**System data will be restored with application data, so this STR is duplicated with STR136**~~

5.2.5 Physical Configuration

All limitations are cumulative, For step2.1, only in brick IO is supported. For step2.2, Max. number of IO will be limited to avoid overlapping with M340 offer.

[STR150] Max. number of Digital I/O channels is 32

Status: Negotiable = Must

In step2.1a: 8 dig in, 8 dig out and 16 dig channel for HSC (in case of being reconfigured as dig channels).

Ideally, no more than 64 for step2.1, and no more than 128 for step2.2

[STR151] Max. number of Analog I/O channels is 4

Status: Negotiable = Must

In step2.1a: 4 analog input channels only

No more than 12 for step2.1b and no more than 32 for step2.2

[STR152] Max. number of Expert channels is 2

Status: Negotiable = Must

In Step2.1a: 2 embedded HSC channel only

In future steps: This limit includes the expert channel of option module and embedded in CPU.

[STR153] Max. number of Field Buses masters is 2

Status: Negotiable = Must

In step2.1a: Serial, CANopen only

In future steps: We don't propose to support X80 communication modules. This limitation includes ports embedded in the CPU

~~**[STR154] Max. number of Sensor buses masters is 4**~~

~~Status: Negotiable = Should~~

[STR155] Max. number of network is 3

Status: Negotiable = Should

In step2.1a: Serial bus to inclinometer, CANopen to VSD(ATV) and Ethernet to upstream

In future steps: We don't propose to support X80 communication modules. This limitation includes ports embedded in the CPU

5.2.6 Internal Objects

[STR156] Real Time Clock Backup (Worst case: min 4 weeks)

Status: Negotiable = Must

Follow current M340 solution without battery is preferred.

Keep same accuracy as M340 RTC.

[STR157] All system bits and words of M580 and M340 are implemented when significant

Status: Negotiable = Must

Reuse common parts same %S and %SW as M340, no need to define new system bits or words. Maybe some specific M1080 system bits need to be defined.

[STR158] An user accessible system counter is refreshed each millisecond

Status: Negotiable = Should

[STR333] Support data dictionary

Status: Negotiable = Should

5.2.7 Application Execution

[STR159] Multi-tasks capabilities

[STR159.1] One Mast task, supports periodic and cyclic

Status: Negotiable = Must

[STR159.2] One Fast task, supports periodic

Status: Negotiable = Should

6 ms periodic fast task has been used in Gemasolar application.

If Mast task cycle time can be less than 20ms, we do not need fast task for CSP application.

~~[STR159.3] One Auxiliary task~~

~~Status: Negotiable = May~~

~~[STR159.4] 16 I/O Event tasks~~

~~Status: Negotiable = May~~

~~[STR159.5] 8 Timer event tasks~~

~~Status: Negotiable = May~~

[STR159.6] Affect I/Os to task by board

Status: Negotiable = Should

[STR160] Floating point computation capabilities

Status: Negotiable = Must

[STR161] Provide capability to support diagnostic features

Status: Negotiable = Must

These features need to be as same as M340 in Unity Pro.

[STR162] Non signed arithmetic computation capabilities

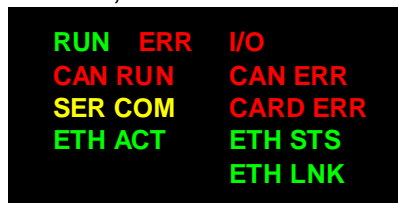
Status: Negotiable = Should

5.2.8 Hardware

[STR163] One Led bloc provide enough information to diagnose the CPU, the embedded Terminal and COM ports and the SD card (if applicable) status

Status: Negotiable = Must

like this, but need to show more information of power supply.



Label	Pattern	Indication
RUN (green): operational state	on	PLC functioning normally, program running
	flashing	PLC in STOP mode or blocked by a software detected error
	off	PLC not configured (absent, invalid, or incompatible application)
ERR (red): detected error	on	Processor or system detected error

	flashing	* PLC not configured (absent, invalid or incompatible application) * PLC blocked by a software detected error
	off	Normal status (no internal detected errors)
I/O (red): input/output status	on	* Input/output detected error originating from a module or channel * Configuration detected error
	off	Normal status (no internal detected errors)
SER COM (yellow): serial data status	flashing	Data exchange on the serial connection in progress (receiving or sending)
	off	No data exchange on the serial connection
CARDERR (red): memory card detected error	on	* Memory card absent * Memory card not recognized * Memory card content differs from the application saved in the processor
	off	* Memory card recognized * Memory card content identical to the application saved in the processor
CAN RUN (green): CANopen operations	on	CANopen network operational
	rapid flashing (on for 50 ms, off for 50 ms, repeating)	Automatic detection of data flow or LSS services in progress (alternates with CAN ERR)
	slow flashing (on for 200 ms, off for 200 ms, repeating)	CANopen network pre-operational
	1 flash	CANopen network stopped
	3 flashes	downloading CANopen firmware
CAN ERR (red): CANopen detected errors	on	CANopen bus stopped
	rapid flashing (on for 50 ms, off for 50 ms, repeating)	Automatic detection of data flow or LSS services in progress (alternates with CAN RUN)
	slow flashing (on for 200 ms, off for 200 ms, repeating)	CANopen configuration not valid
	1 flash	At least one of the detected error counters has reached or exceeded the alert level
	2 flashes	A guard event (NMT-slave or NMT-master) or a heartbeat event has taken place
	3 flashes	The SYNC message was not received before the end of the communication cycle period
	off	No CANopen detected error
ETH STS (green): Ethernet communication status	off	No communication activity
	on	Communication OK
	2 flashes	Invalid MAC address
	3 flashes	Ethernet link not connected
	4 flashes	Duplicate IP address
	5 flashes	Waiting for a server IP address

	6 flashes	Secure and safe mode (with default IP address)
	7 flashes	Configuration conflict between rotary switches and internal configuration
CARDAC (green): memory card access Note: This LED is located under the memory card door.	on	Access to the card is enabled
	flashing	Activity on the card; during each access, the card LED is set to OFF, then back to ON
	off	Access to the card is disabled. It is possible to extract the card after the access to the card has been disabled by generating a rising edge on the bit %S65.
ETH ACT (green): Ethernet communication (transmission/reception) activity	on	Communication activity detected.
	off	No communication activity detected.
ETH LNK (green): Ethernet link status	on	Ethernet link detected.
	off	No Ethernet link detected.
	off	No communication activity

[STR164] Provide a SD card slot in the front panel of all controllers

Status: Negotiable = Should

If SD card is supported in M1080 step2.1a, the SD card slot MUST be in the front panel.

[STR165] Network marking on CPU (MAC address, ...) is readable when module is mounted

Status: Negotiable = Should

5.2.9 Operating Modes

5.2.9.1 Power On / Off

[STR166] All behavior identical to M340

Status: Negotiable = Must

For the adjust parameter operation mode must be identical as M340 for cold start and warm start

5.2.9.2 Physical user action

[STR167] A Cold start and rack reset can be initiated by a push button accessible on front panel

Status: Negotiable = Must

Reset button can be operated with tool

[STR168] Memory card can be plugged / unplugged power on, PLC in RUN

Status: Negotiable = Should

Memory card means SD card, as same as M340 CPU

In order to avoid any alteration of the card content, user has to make a remove request and then to wait the information that he can process safely.

5.2.9.3 Software user action

[STR169] All behavior identical to M340

Status: Negotiable = Must

[STR170] Give clear status of inconsistency between application in RAM and in static memory (e.g. SD Card) on the PLC

Status: Negotiable = Must

Both application (System bit for example) and user (LED and Unity Pro message for example) are informed of non-consistency

5.3 Communication

5.3.1 General requirement

[STR171] All controllers comply with Transparent Ready standard

Status: Negotiable = Must

[STR172] All controllers comply with Ethernet Communication Service Class 20

Status: Negotiable = Must

[STR173] All controllers comply with Web Server Class B (standard web server)

Status: Negotiable = Should

Web server is not mandatory in CSP application, but it will bring great help to differ from competitor's offer.

5.3.2 CPU embedded communication ports

All controllers provide 4 communication ports out of the 3 core standards (Serial, Ethernet Can Open) + 1 USB Device for programming terminal (Unity Pro, Unity Loader) and HMI connection, two Ethernet ports share one MAC address with a embedded switch.

The hardware architecture is the same for all the MDI step2.1 controllers in order to reduce the development and manufacturing costs.

Ethernet:

Mainly for upstream communication, being introduced more and more in automation applications.

To preserve performance, the Ethernet embedded port supports a limited set of services, according to the configuration selected by the user.

CANopen:

Mainly for downstream communication with field device, like ATV. May be substituted by Ethernet in the future (MDI step2.3)

For cost reduction and performance reason, CANopen master will be integrated in the controller.

Serial line:

Communicate with field device (downstream, like power meter) or HMI (upstream), and sometimes link to modem, radio and printer.

For cost reduction reason, one multi-protocol serial line port will be integrated in the controller.

[STR174] From Unity connected on the USB port, the user can communicate with :

- The complete local station: the CPU and all the modules (diag)
- All the local bus: the stations connected on CANopen
- Any remote station connected on Ethernet Modbus TCP (Not applicable when not support Modbus TCP client)

Status: Negotiable = Must

5.3.3 Terminal Port

[STR175] A USB device port is available on all controllers, Connector for USB is USB mini-B

Status: Negotiable = Must

[STR176] Support the SE existing USB cable reference BMX XCA USB H018 (1.8 m) and BMX XCA USB H045 (4.5m).

Status: Negotiable = Must

[STR177] All on-line services provided by the Unity Pro are available

Status: Negotiable = Must

Identical to M340, except I/O debug screen

[STR178] The terminal port can be used to connect a PC

Status: Negotiable = Must

[STR179] The terminal port can be used to connect a local HMI

Status: Negotiable = Must

USB HMI is used in CSP application for adjusting parameters and configurations, during commissioning.

Need device drive in HMI? Check with HMI designer, or find a HMI which supports this function.

5.3.4 Serial Lines

5.3.4.1 Common features

Basically, the same features are supported as embedded port of M340 CPU.

[STR334] Up to 8 devices can be connected in the address range 1 to 8

Status: Negotiable = Must

In CSP application, serial line is for communicating with inclinometer and typically, only 1 modbus device is connected.

5.3.4.2 Interface

[STR180] Connector is RJ45 in accordance with the Modbus standard (Modbus.org web site).

Status: Negotiable = Must

[STR181] Line polarization is user configurable from Unity.

Status: Negotiable = Must

Line polarization is configurable when RS485 port is used as Modbus mode.

[STR182] Baud-rate is configurable from 300 up to 38,400 bps

Status: Negotiable = Must

Modbus link default value is 19,200 bps.

Character mode link default value is 9,600 bps

[STR183] RS232D port acts as a DTE (Data Terminal Equipment)

Status: Negotiable = Must

[STR335] Common mode voltage not higher than 50VDC (2 minutes) will not damage the port, when serial port is using as RS-485 mode

Status: Negotiable = Must

5.3.4.3 Cables:

[STR184] Reuse current cable offer, no new cable reference is required.

Status: Negotiable = Must

5.3.4.4 Accessories:

[STR185] Reuse current offer to provide isolation for the CPU serial port

Status: Negotiable = Must

Use ~~TSXPACC012~~ TWDXCAISO?



TWD XCAISO. pdf

5.3.4.5 Protocols:

[STR186] Modbus Master / Slave RTU with full addressing capacity

Status: Negotiable = Must

[STR187] Modbus Master / Slave ASCII with full addressing capacity

Status: Negotiable = Must

[STR188] Character protocol with maximum frame size of 255 bytes .

Status: Negotiable = Must

5.3.4.6 Programming on Unity Pro

[STR189] Same operation method (like FB) as M340

Status: Negotiable = Must

[STR190] Reuse same FB as M340, when same method or mechanism is.

Status: Negotiable = Should

- Reuse as much as possible
- If some EF/EFB can't be reuse, like "write_param", we can provide a new one like "write_param_m1080" with same function.

[STR191] Online switch from Modbus slave to master mode is possible via a WRITE_CMD command

Status: Negotiable = Must

[STR192] Same Unity Pro screens have to be used to configure the same services as M340

Status: Negotiable = Must

[STR193] Diagnostic screens are identical to M340

Status: Negotiable = Must

[STR194] All controllers provide at least one embedded serial port

Status: Negotiable = Must

[STR195] Modbus port provides a 5V power supply for the local HMI

Negotiable = Must

Economic HMI XBTN can be powered by the bus. In order to simplify and reduce the installation cost, the CPU serial port will provide it for a point to point connexion.

[STR196] Serial port support character protocol with maximum frame size of 4 Kbytes.

Status: Negotiable = Must

5.3.5 CANopen

5.3.5.1 Commons

[STR197] 1 CANopen master embedded port on CPU

Status: Negotiable = Must

[STR198] Up to 8 devices can be connected in the address range 1 to 8

Status: Negotiable = Must

In CSP application, CANopen is for communicating with VSD (ATV32) and typically, only 2 VSDs is connected. In same application, Lexium is also used, and may be future trend.

In step2.1b, some target application, e.g. WWW filter, wants more than 10 CANopen devices.

5.3.5.2 Physical interface:

[STR199] The interface is conforming to the Schneider CANopen standard .

Status: Negotiable = Must

[STR200] Isolation level is 500 Volt AC or 700Volt DC between communication line and ground.

Status: Negotiable = Must

5.3.5.3 Services:

[STR201] All the CANopen ports are conforming to M20 class, except devices support value is 8

Status: Negotiable = Must

SE Device	CANopen	Physical and Cabling characteristics						
Identification :								
Product Department :	HEC							
Product family :	M1080							
Product Description :	CANopen master embedded port or CANopen master module							
Product Reference :	M1080 Box1 and Box2							
Conformance :								
CANopen Device type	Master							
Conformance Class	M20							
Address range	1-8 (8 slaves max on the CPU)							
Baud rates supported	1 M	800 K	500 K	250 K	125 K	50 K	20 K	10 K
	Y	N	Y	Y	Y	Y	Y	N
LSS supported	No							
Powered	No							
Connectivity :								
CANopen Connector	SubD9							
Specific Accessory	No							
Compliant SE Connectors	list of references							
Compliant SE Drop Cables	list of references							
Fan out Max	8							

		M10	M20	M30
Layer Settings	Slave ID	1-16	1-63	1-127
	Baudrate	125,250,500	M10 + 20,50,1000	M20 + 10, 800
	LSS			Master
Devices Supported		16	8	126
NMT	NMT-Master	NMT- Master according to DS301	As M10	
	CANopen Manager			NMT- Master according to DS301, Configuration Manager according to DSP302
	Boot-up procedure	according to DSP302	As M10	As M20
	Time stamp			producer
	Auto Config			support
SDO	SDO Client	1 SDO Client	1 SDO Client	2 SDO Client
	SDO Server	none	1 SDO Server	1 SDO Server
	SDO Manager			1 SDO Manager
	SDO data transfer	Expedited, segment transfer	Expedited, segment transfer	Expedited, segment, block transfer
PDO	COB-ID	ReadOnly	ReadWrite	ReadWrite
	PDO TT	254, 255	M10 + 0, 1-240	as M20
	PDO Inhibit Time	None	TPDO's (Read/Write)	TPDO's (Read/Write)
	PDO Event Timer		TPDO's (Read/Write)	RPDO's & TPDO's (Read/Write)
SYNC	SYNC	none	producer	producer / consumer
	TRIGGER			producer
EMCY		consumer	consumer / producer	As M20
HEALTH	Heartbeat	16 consumer 1 producer	8 consumer 1 producer	126 consumer 1 producer
	Node Guarding	no	yes	yes
ParmS	Store Parameters	No	yes	yes

5.3.5.4 Configuration

[STR202] CANopen configurator is conform to level 2, except number of devices support

Status: Negotiable = Must

	Level 1	Level 2	Level 3
Additional supported Baudrate (kbit/s)	125, 500	Level 1 + 20, 50, 1000	Level 2 + 10, 800
Number of supported Modules (including Master)	17	64	127
Supported Address-range of the I/O-Modules	1 ? 16	1 ? 126	1 ? 126
Max. Number of supported PDOs	64 RxPDO 64 TxPDO	256 RxPDO 256 TxPDO	504 RxPDO 504 TxPDO
Range of additional supported COB-ID allocation	0x680 ? 0x68F	0x680 ? 0x6BF	0x680 ? 0x6DF
Allow change of I/O modules Default PDO Mapping	No	Yes	Yes
Allow change of I/O modules Transmission Type	No	Yes	Yes
Allow user input for Heartbeat time or Guard time and Lifetime factor	No	Yes	Yes
Allow slave to slave, broadcast communication	No	No	Yes
Device Description Import function into Catalog Server	No	Yes	Yes
Debugging features available	No	No	Yes, Object Dictionary Browser, Device Configurator

[STR203] The configuration is integrated in Unity Pro:

Status: Negotiable = Must

CANopen is one of our core field bus. Customers are expecting to have services directly inside Unity. Services means:

- Declare the devices on the bus editor; configure the CAN master and the bus
- Configure the devices, including non modular devices (with or without parameters), modular devices (like Automation islands) and third-party devices
- Online services (debug and operation)

The bus coupler is provided in several manners:

- Native coupler in the CPU
- Additional module inside the configuration

Either in one case or the other, the configuration of the bus is done inside Unity through the selection of the bus coupler.

This configuration is graphical and consistent with the configuration of Fipio or Ethernet I/O scanner: same philosophy, ergonomic, screens,...

From the selection of the bus coupler inside the configuration (directly by selection of the coupler in the configuration browser or inside the configuration editor), the user launches the bus editor. From the selection of a node, he selects a device from the hardware catalog.

The external behavior is similar to the management of the Fipio/Ethernet I/O bus:

- Inside the structural browser, a node corresponding to the CANopen bus, with all the devices on the bus as a list.

- A bus editor displaying all the devices on the bus, with the possibility to add a comment to each node.

Note: depending on the kind of device (Non modular, modular or third party), there are different behaviors. The different cases are described below.

The objective is to suppress the external tool like SyCon tool, for price reduction and better ergonomic for the customer.

[STR204] Configuration of the devices on CANopen is done through Unity Pro

Status: Negotiable: Must

The user has two ways to configure the devices:

- From the hardware browser in Unity, he selects a device assigned to a node.
- From the CANopen bus editor, the user selects a node on the bus.

The operating mode to configure the device depends on the kind of devices:

- Devices that are configured directly from Unity (non-modular devices as simple devices like I/Os). In this case, when opening the configuration editor, the user has tabs to edit and view the configuration.
- Devices that are configured from another tool. In this case, when opening the configuration editor, the user launches the corresponding tool. As long as the configuration of the device hasn't been imported inside the Unity application, the tabs inside the editor are empty. This case corresponds to Automation island (configured with Advantys), Drives & motor starters (if they Must be configured with PowerSuite), any other Schneider device in the same case and third-party devices. When the configuration is done, the user has to import the configuration inside the hardware catalog. When the device is known inside the hardware catalog, the configuration screens of the device are filled in with the information deduced from the data imported.

[STR205] Each device has configuration and adjust screens to ease its management

Status: Negotiable: Must

The device editor supports different tabs corresponding to different views:

- An overview tab, that describes the main features of the device. It is only available for Schneider devices that are configurable directly from Unity.
- A configuration tab that contains the list of channels and I/Os parameters that Must be configured. In case of a device with a lot of parameters (ex: a drive), there is a list containing the name of the parameter and the value that can be modified.
- An I/O object tab that lists all the objects managed by the device and deals with the language interface. From this tab, it is possible to assign a symbol to an object or a group of objects.
- A debug screen that displays on-line information. The content depends on the kind of device: for a single device (ex: inputs), it displays the topological address, the symbol and the value; for a complex device, there is a generic screen that allows to send commands to the device according to the CAN protocol.

The information of configuration and debug tabs is displayed in a grid. The choice of having a grid instead of a tree list is motivated by capability to display more information at the same time on a grid: it is possible to display several parameters of a channel on the same line. A tree list means that one piece of information is displayed on one line.

[STR206] Predefined settings for Schneider devices :

Status: Negotiable = Must

Most of parameters are predefined, in order to hide the CANopen complexity to the user.

The Unity configuration screens will require the user to specify how he wants to see the remote device, i.e. to select which device variables he wants to map to the PLC application (topological %IW, %QW, %I and %Q). A predefined list will be proposed, according to the pre-mapped variable configured in the EDS file provided by the device manufacturer.

The user doesn't manipulate CANopen communication objects like PDOs or SDOs, but only device specific and PLC objects.

Predefined settings include also:

- Network Management mode (heartbeat or node guarding, with a preference for heartbeat which seems more performant)
- Transmission mode: 0 for analog (cyclically), 255 for digital (upon event)

[STR207] Master configuration is part of the PLC application .

Status: Negotiable = Must

The need is to maintain the system easily; when it is needed to restart the system (after replacement of a device, change of processor, modification of the program or configuration...), the system recovers the configuration. It means that the devices on the bus get their configuration from the CPU.

[STR208] Configuration of the devices is stored inside the application

Status: Negotiable: Must

As mentioned above, the user may have an application with device configurations done through several tools. The need is to be able to recover the application at any time:

- With a PC that was not dedicated to the design of this application, being able to reopen and operate with the application (situation during maintenance, for example).
- When uploading the application with an empty console, being able to reopen the application for operation.

It means that the device configuration Must be inside the application and also in the upload information embedded inside the PLC. It is acceptable to do additional activity to recover the consistency of the hardware catalog from information stored in the application file or upload information.

[STR209] Unity Pro manages a hardware catalog that includes CANopen third-party devices

Status: Negotiable = Must

This catalog contains different kinds of devices:

- "Standard" Schneider devices. They are directly configured from information embedded inside the catalog description.
- "Modular" or configurable Schneider devices. They Must be configured through an external tool (ex: Automation Island). Then the configuration is imported inside the hardware catalog to be used as any device.

- Third party devices. The user imports the file corresponding to the CANopen device (EDS file). The I/Os addressing of the device is deduced from the content of the imported file. With the adjust screen of the device, the user has all the parameters of the devices in a grid, with the current values.
- As far as Schneider device profiles have been defined for CANopen devices, they Must be included inside the hardware catalog in order to configure a device that conforms to a profile.

The add-ons in the catalog Must easily transferred to other programming workshops. Even if the programming workshop doesn't have the complete update of the catalog corresponding to the content of the application, it Must be possible to open the application or upload the application from the PLC. In this specific case, it is acceptable to do additional operations to recover the update of the hardware catalog in Unity.

[STR210] XML EDS files can be imported in order to integrate third party devices in the configuration.

Status: Negotiable = Should

XML EDS files file be standardized end of 2004 within Schneider and then adopted by the CiA before 2006.

[STR211] Unity Pro configuration tool can sniff the CANopen devices connected on the bus, and proposes it in Unity Pro to facilitate their configuration (currently supported by Rockwell on DeviceNet).

Status: Negotiable = May

5.3.5.5 Programming

[STR212] CANopen PDOs are mapped on topological addresses , Input/output words or bit depending on the module characteristics.

Status: Negotiable = Must

According to the geographical location of the I/O, the I/O has a unique topological address. This allows updating the program very easily when the user moves the device from one node to another on CANopen field bus.

Variables of different types, analog and digital for example will be splitted in different objects, when possible: for example, it is not possible for STB Automation Island...

For the first launch, a modular device is seen as a compact device. There is no possibility to address a slot inside a modular device.

[STR213] Devices are mapped on a data structure ~~(IODDT)~~

Status: Negotiable = Must

~~In complementary of the use of topological unitary objects (%I, %Q, %IW, %QW,...), Schneider devices and third party devices can be mapped to IODDTs.~~

Mapping on IO DDT or State Ram,

To be checked with FW architecture and system definition

[STR214] Bit and analog forcing and edge detection are proposed on digital and analog variables, like in rack I/Os.

Status: Negotiable = Must

[STR215] CANopen PDOs are also mapped on flat %MW and %M

Status: Negotiable = Must

This will give better performance for HMI that wants to access the remote device data: possibility to read or write the whole data in a single Modbus request.

The consequence is that the user will have to reserve 4 areas in the PLC memory;

Input Words %MW, Output Words %MW, Input bits %M, Output bits %M

[STR216] CANopen bus is synchronized on Fast or Mast task

Status: Negotiable = Must

Link to the Fast task is mandatory to satisfy high performance application like packaging, when response time in the range of 5ms are required. The CANopen communication parameters that are computed by Unity Pro Must be selected in accordance.

There is no possibility to attach some slaves to the mast and some other to the fast: all the bus is linked to one task.

[STR217] SDO access is done via standard communication function blocks READ and WRITE.

Status: Negotiable = Must

[STR218] Possibility to start a device that has been configured locally, without scratching its parameters .

Status: Negotiable = Must

Some devices can be configured locally by plugging a tool on a dedicated port, or via the CANopen bus. The PLC application Must be able to start and communicate with the device without downloading any initial configuration.

[STR219] Parameter storage in the device can be forced from the PLC application

Status: Negotiable = Should

This is a standard CANopen function that is supported by the M20 profile. It is a complement of the FDR feature: if the parameters are stored in the device, after a power on, the device will start directly with the right parameters. Without this function, the application will have to readjust the device parameters by sending SDO requests.

5.3.5.6 Diagnostic

[STR220] Unity Pro integrates efficient diagnostic screens for the bus and the devices .

Status: Negotiable = Must

Same diagnostic is also possible from the PLC application. To be consistency with M340.

[STR221] Diagnostic of devices on the bus is displayed in Unity Pro diagnostic viewer

Status: Negotiable: Must

When a failure occurs, the PLC is warned of the failure (status bits,...). This information Must be available in system bits and words and a fault is stored in the diagnostic buffer of the PLC in order to display the alarm in the diagnostic viewer.

The message Must contain the node number on the bus. There is no requirement to have more detailed information: the user has to use the right tool to go deeper in the analysis.

5.3.5.7 Performance

[STR222] There is no limitation in term of amount of variable that can support a remote device .

Status: Negotiable = Must

Some devices support more than 4 PDOs. The Unity implementation Must support it, whatever the allocation between PDOs and PLC variables.

5.3.6 Communication Commons

5.3.6.1 Communication function blocks

[STR223] The communication function blocks are common to M340.

Status: Negotiable = Should

[STR224] READ_VAR and WRITE_VAR will manage following Modbus requests

Status: Negotiable = Should

Requête Modbus	Code fonction	Fonction de communication
Lecture bits	16#01	READ_VAR
Lecture mots	16#03	READ_VAR
Ecriture d'un bit ou de n bits	16#05 ou 16#0F	WRITE_VAR
Ecriture d'un mot ou de n mots	16#06 ou 16#10	WRITE_VAR
Lecture bits d'entrée	16#02	READ_VAR
lecture mots d'entrée	16#04	READ_VAR

This STR is consistent with embedded port in M340 CPU. We can also use other Modbus EF/EFB, such as MBP_MSTR, Read_reg/Write_reg and XMIT.

[STR225] READ and WRITE will manage unlocated variables.

Status: Negotiable = Should

To be consistent, unlocated variables should be managed by OFS (this is the case), by the Web servers and by the application.

PRINT_CHAR, INPUT_CHAR will be used for character mode.

These EF will also be used on Quantum in replacement of an other feature of the XMIT.

Sending and receiving message up to 4 Kbytes length will be possible on the CPU embedded port only, so that compatibility with Premium (4 Kbytes) and Quantum (1 Kbytes) is guaranteed.

For the modules, the limit will be 255 characters

READ_STS is maintained and will be used also on CANopen to read the detailed diagnostic of a slave, in replacement of the current SEND_REQ.

~~WRITE_CMD is maintained and will be used to switch from slave to master mode on the CPU Modbus embedded port (switch from slave to master on the fly is not needed in step 2.1 at least)~~

5.3.6.2 Operating modes

[STR226] Channel re-initialization is possible from the application

Status: Negotiable = May

As we will use embedded Ethernet support in Spear 320 processor, this capability may not be realistic.

5.3.6.3 System performance

[STR227] Maximum 16 communication EF can be managed in parallel

Status: Negotiable = Must

[STR228] Maximum 8 requests of 256 bytes can be treated per PLC scan (sum of the requests coming from all the communication ports)

Status: Negotiable = Must

The maximum number of request to be treated per cycle is also configurable via a system word, in order to avoid jitter in the scan time.

[STR229] The HW and SW architecture privileges the Distributed peripheral communication against other communication (means give some higher priority): CANopen and/or Ethernet I/O, depending on the product reference and the configured profile.

Status: Negotiable = Must

[STR230] The SW proposes a way to control CPU resource allocation to the different tasks:

Status: Negotiable = Must

The first performance calculation shows that the CPU workload is very influenced by the different tasks, and mainly by the Ethernet services: I/O scanning, Global data or even messaging.

Some of these services are configured locally in the PLC and doesn't present major problems, but some others, like Global Data or system requests, are not only dependant on the local configuration and can provoke CPU overload,

[STR231] PLC application and CANopen traffic is not perturbed in case of Ethernet overload or perturbation

Status: Negotiable = Should

5.3.7 Ethernet

5.3.7.1 Ethernet General Requirements

These customer needs and Marketing requirements are common to all the Ethernet connected modules for the SE MidRange PLCs, such as M340.

[STR232] follow the SE Transparent Ready interoperability standards

Status: Negotiable = Must
refer to transparent ready user guide -- 31006929k03000 on planet.

[STR233] provide the ability to be connected in a star topology.

Status: Negotiable = Must

[STR234] provide the ability to be connected in a daisy-chain topology.

Status: Negotiable = Must

Embedded switches in the Ethernet modules and/or CPU may be a suitable solution. This function is mandatory for CSP application. Refer to their current topology architecture of M340 controllers.

[STR235] offer a redundant cabling topology for daisy chain

Status: Negotiable = Must

A daisy chain can be made into a simple ring.

[STR236] The network recovery time is less than 50 ms for 40 devices.

Status: Negotiable = Must

5.3.7.2 Interoperability requirements

[STR237] Support Modbus TCP server on all the Ethernet ports, including diagnostic functions

Status: Negotiable = Must

The controller can be polled by other I/O scanner (it is Modbus server)

[STR238] Support Modbus TCP client on all the Ethernet ports

Status: Negotiable = Should

[STR239] Provide I/O scanner via Modbus TCP on all the Ethernet ports

Status: Negotiable = May

[STR240] Support Ethernet/IP adapter on all the Ethernet ports, including diagnostic functions

Status: Negotiable = Should

The controller can be polled by other I/O scanner (it is Ethernet/IP adapter)

[STR241] Support Ethernet/IP scanner on all the Ethernet ports

Status: Negotiable = Should

[STR242] Provide I/O scanner via Ethernet/IP on all the Ethernet ports

Status: Negotiable = May

[STR243] Ensure that the embedded port and the Ethernet modules are able to support a maximum of 1Kbyte length UMAS requests in client and server mode.

Status: Negotiable = Must

5.3.7.3 Configuration and installation

5.3.7.3.1 Addressing

[STR244] Enable a maintenance person to install the product and have the IP address and device name automatically configured without using Unity Pro.

Status: Negotiable = Must

Consider use of a rotary switch (similar to M340) to define a role name. This should be compatible with Faulty Device Replacement and DHCP/BOOTP.

[STR245] Ensure the CPU and Ethernet module IP address can be easily set (<1 minute) for the first use of the product

Status: Negotiable = Must

[STR246] support a means to configure a device's IP address from Unity, role name and device parameters through a configuration tool (e.g. Unity).

Status: Negotiable = Must

[STR247] support a means to configure a device's IP address via the Web , role name and device parameters.

Status: Negotiable = May

This function is not mandatory for CSP application (step2.1a), but should be implemented in step 2.1b and later.

5.3.7.3.2 Hardware

[STR248] use a standard shielded RJ45 connector capable of 700 insertions

Status: Negotiable = Must

[STR249] support 10baseT/100baseTX operation.

Status: Negotiable = Must

[STR250] follow SE color coding standards on Ethernet ports.

Status: Negotiable = Must

[STR251] clearly label the ports as "Ethernet" in a font size at least 10 pt.

Status: Negotiable = Should

Visibility and legibility in less than optimally lit locations is vital. This will prevent errors and reduce installation & product replacement time. Note that, in badly lit environments color can be incorrectly perceived. Conforming [elsewhere] to the rainbow spec ensures that Schneider color is used.

[STR252] auto-sense/auto-negotiate 10/100 Mbps and Half & Full duplex operation .

Status: Negotiable = Must

~~**[STR253] have a mechanism to restart the Ethernet component without disassembling product hardware**~~

~~Status: Negotiable = Must~~

[STR254] automatically adapt to operation with a straight or crossover cable .

Status: Negotiable = Must

If the switch does not support Auto MDIX, then the feature is needed on the coupler.

5.3.7.3.3 Programming software (Unity Pro)

[STR255] provide all services available on TER USB port also on Ethernet port

Status: Negotiable = Must

[STR256] ensure that all configurations can be done via Unity Pro without need for web configuration.

Status: Negotiable = Must

[STR257] Configuration of the devices is stored inside the application

Status: Negotiable: Should

[STR258] Configuration of the device is stored in the PLC

Status: Negotiable = Should

[STR259] Configuration of the bus is stored in the PLC

Status: Negotiable: Must

[STR260] embed MSU (massive software upgrade) function in Unity Pro.

Status: Negotiable: Should

[STR261] add a link to MSU (massive software upgrade) software in Unity Pro.

Status: Negotiable: Must

[STR262] map I/O variables on %MW

Status: Negotiable = Must

In order to make it accessible remotely (no requests available today to access topological objects on Modbus), and also to provide better performance (100 words accessible in a single request).

To allow SCADA devices to access information in one request

5.3.7.4 Reliable Operation

[STR263] detect and display error when the controller's configured IP address is already in use on the network and this device must remain off-line until the problem is resolved.

Status: Negotiable = Must

[STR264] ensure that product is undamaged if connected in error to a Schneider Automation Modbus device via a Schneider Modbus cable to the Ethernet port. .

Status: Negotiable = Must

[STR265] support at least 8 Modbus client connections and 1 FTP connection simultaneously .

Status: Negotiable = Must

[STR266] support 10/100 Mb/s full duplex communications.

Status: Negotiable = Must

5.3.7.5 Secure Operation

[STR267] have default as no security at device level.

Status: Negotiable = Must

This is so that a maintenance person can connect his computer to a local switch and view or change the parameters of devices connected to that switch. The rationale is that we do not want to delay product replacement during down time because of security issues.

[STR268] employ industry standard methods to allow higher levels of security.

Status: Negotiable = Should

Include any improved security created for the current PLC platform, such as Quantum, M580.

5.3.7.6 Easy Maintenance

5.3.7.6.1 Firmware downloads

[STR269] Firmware download to be performed in a reasonable time (10 minutes) irrespective of the protocol or method used.

Status: Negotiable = Must

[STR270] LEDs showing status & useful diagnostics on the front panel .

Status: Negotiable = Must

Maintenance people rely on visual interfaces to get initial information about device status and will not accept a device with no LEDs to get information about the status of the Ethernet connection

[STR271] display the module's current IP address on the controller's front panel.

Status: Negotiable = May

A LED or LCD [matrix] display would greatly improve the display of diagnostic and module identity information. Rival solutions are implementing these diagnostic displays.

[STR272] be able to clearly show the MAC address on the module/CPU front panel.

Status: Negotiable = Must

A visible and easily read, permanent label with 10 point or greater font will suffice.

[STR273] be able to determine precisely which Ethernet device is faulty in star, "bus-like" and daisy-chain topologies.

Status: Negotiable = Must

[STR274] Have FDR Client Regular (advance) function in controller

Status: Negotiable = Must

To enable a maintenance person to replace a faulty device with a new device and to automatically get an IP address and parameters from FDR server.

[STR275] support SNMP to enable additional Ethernet diagnostic information through MIBs and to provide be coherent with standard IT network support diagnostics.

Status: Negotiable = Must

[STR276] support Internet Explorer for File Transfer Protocol

Status: Negotiable = Should

This allows maintenance by a person who accesses FTP via the IE browser. Another example of being "IT friendly".

[STR277] Supports an embedded web server with remote data editor and rack viewer

Status: Negotiable = Must

[STR278] RDE access to unlocated variables (symbols)

Status: Negotiable = Should

This is a lower priority because it will be not possible from the CPU. Unlocated variables should be accessible in a consistent way, that is from the Web, the PLC application or any HMI.

Access to variables via symbol requires a configuration screen which is part of Unity Pro software (No extra onfiguration software / CD is required)

The configuration will consist in selecting Unity variables to make accessible via the web and to determine security associated with these variables (Read only or read/write)

[STR279] present Ethernet I/O diagnostic info on Rackviewer page

Status: Negotiable = Must

[STR280] present CANopen diagnostic info on Rackviewer page

Status: Negotiable = Must

[STR281] Enable access to the new Rackviewer and RDE features from a standard browser without additional configuration tool.

Status: Negotiable = Should

5.3.7.6.2 Targeted response times:

[STR282] Time to display a screen via GDE or custom HTML page (screen containing 20 animated objects)

Status: Negotiable = Must

[STR283] 1st access time (screen never accessed) is <30s [on Ethernet]

Status: Negotiable = Must

[STR284] 1st access time (screen already accessed: cache memory) is <15s [on Ethernet]

Status: Negotiable = Must

[STR285] Change of screen time <10s [on Ethernet]

Status: Negotiable = Must

[STR286] Refresh time (for less than 10 variables) <1s [on Ethernet]

Status: Negotiable = Must

5.3.7.6.3 Ethernet Addressing improvements

The purpose is to enable a Dynamic Ethernet Address facility in the M1080 Embedded CPU.

For the customer this allows one PLC application to be used in many installations without having to rebuild the application for each location that uses a new IP address.

Dynamic Ethernet addressing similar to M340

[STR287] The PLC application is able to read the current IP parameters of the Ethernet ports

Status: Negotiable = Should

[STR288] The PLC application is able to update the current network address with a new IP address, Subnet Mask and Default Gateway to any Ethernet port configured in the PLC application.

Status: Negotiable = Should

[STR289] The Ethernet Port responds to the request to change the IP parameters, within 3 scans or 100 mSec whichever is greater.

Status: Negotiable = Should

The actual time to implement the new IP address will depend upon the duration of the orderly shutdown, which is dependent upon the open connections.

[STR290] The Ethernet ports issue ARPs to announce their new IP/MAC

Status: Negotiable = Should

[STR291] The PLC application must remain identical before and after the address assignment, allowing connection by Unity Pro in an 'identical' state (no hardware or applications changes from original program).

Status: Negotiable = Should

[STR292] IP parameters received by the Ethernet port from the application Must be validated using the same validation rules as are applied to IP parameters that are sent from the PLC's configuration

Status: Negotiable = Should

[STR293] The Ethernet Port Must provide feedback to a user application, with an error code if needed, to show that the IP parameters are acceptable

Status: Negotiable = Should

5.3.7.7 Easy to Upgrade

[STR294] enable the firmware to be upgradeable using a standard Schneider firmware upgrade utility software (e.g. Unity Loader) for CPU + embedded IO board FW

Status: Negotiable = Must

5.3.7.8 Requirements for embedded Ethernet port

[STR295] have 2 embedded Ethernet ports, with 1 MAC support ~~Daisy chain loop~~

Status: Negotiable = Must

It's a kind of duplicated STR of STR232 and STR233, what we want to show for this STR is only 1 MAC address is required for 2 ports.

[STR296] have Bandwidth Management between Ethernet services available

Status: Negotiable = Should

[STR297] Ethernet FW update of the CPU via Ethernet

Status: Negotiable = Must

5.3.7.8.1 Distributed Peripheral services

[STR298] support a management of I/Os on Ethernet TCP/IP

Status: Negotiable = Must

[STR299] is compatible with I/O scanner

Status: Negotiable = Must

That means upstream controller can get data from M1080 via I/O scanner. In current CSP architecture, the upstream controller is M340, and using embedded IO scanner in BMXNOC0401.

[STR300] have all new data available in the PLC application within 15 mSec plus a jitter maximum of one application cycle time of receiving data from field devices

Status: Negotiable = Must

[STR301] initiate all pending new data transfers to the Ethernet task within 2 mSec after the end of PLC scan

Status: Negotiable = Must

[STR302] is easy to configure one remote device in less than 1 minute for a maintenance person

Status: Negotiable = Must

5.3.7.8.2 Common Services

[STR303] support RSTP (Rapid Spanning Tree Protocol)

Status: Negotiable = Must

[STR304] recovery time identical to current control products, 50 ms

Status: Negotiable = Must

[STR305] support getting IP address from static IP address, BTOOP and DHCP

Status: Negotiable = Must

[STR306] support NTP client

Status: Negotiable = Should

Synchronize with a NTP server

[STR307] support SMTP client similar to M340 CPU

Status: Negotiable = Should

5.3.7.8.3 Web features

[STR308] The CPU is conform to TR B class

Status: Negotiable = Should

Web service is not required by CSP application, but for step2.1b, to provide same entry level web service will bring benefit to customer. And for RTU, it's a fundamental requirement.

5.4 Software Requirements ---

5.4.1 Configuration

For M1080 controller, to keep a similar behavior like M340 is a requirement, because it's a project oriented PLC and focuses on particular customer/application.

You can see in the network architecture, that M1080 controllers are acting as child controller of M340, and both M340 and M1080 are using in same kind of cabinets in real projects.

- M1080 controls 1 Heliostat only,
- M340 controls 1 Heliostat and collect data from M1080 controllers.

For customer, it's important to manage M340 and M1080 with same software, and it's preferred to have similar behaviors within M340 and M1080.

It should be reused as much as possible of M340 Unity configuration page. The configuration method and interface of CPU, Communication port and embedded IO should be consistent with M340. That means it is modular PLC style.

[STR309] Offer 2 references in Unity Pro S, M, L and XL when selecting a CPU from the M1080 family

Status: Negotiable = Must

Need to define the official reference number/family

[STR310] Support configuration of the network address within a single configuration screen

Status: Negotiable = Must

It should be consider to support both IPV4 and IPV6

[STR311] Synchronize PLC time with a Programmable PC clock

Status: Negotiable = Must

[STR312] Display IO Words used and IO Words remaining when adding local & distributed devices to the CPU configuration

Status: Negotiable = Must

To show the memory usage of the stateram

[STR313] Support to be selected and configured by I/O board

Status: Negotiable = Must

Provide same customer behavior as BMXDDM1602, BMXEHC0200 and BMXAMI0410

[STR314] Same serial port configuration page as M340 CPU

Status: Negotiable = Must

[STR315] Same CANopen port configuration page as embedded CANopen port in M340 CPU

Status: Negotiable = Must

For example: BMXP3420302 CPU

5.4.2 IO organization**[STR316] support IO topological**

Status: Negotiable = Should

Current M340 method, support IO DDT as a option

[STR317] support State Ram

Status: Negotiable = Must

Mandatory for Modbus support.

[STR318] support Device DDT

Status: Negotiable = Should

Future EU control standard

5.4.3 Explicit exchange

Explicit exchange support is same as M340 range, including HSC(like BMXEHC0200), serial link, CANopen and Ethernet.

The following explicit exchanges are using in Gemasolar application.

The following Parameters have been changed in Gemasolar application, by WRITE_PARAM. No other explicit exchange command is used.

IM/EX	Group	Standard symbol	Type	Access	Meaning	Language object
Preset Values	Explicit	PRESET_VALUE	DINT	R/W	Preset value	%MDr.m.c.6
%Qr.m.c.d Words	Implicit	FORCE_REF	BOOL	R/W	Set to preset counter value	%Qr.m.c.5
%Qr.m.c.d Words	Implicit	FORCE_ENABLE	BOOL	R/W	Implementation of counter	%Qr.m.c.6
%Qr.m.c.d Words	Implicit	SYNC_RESET	BOOL	R/W	Reset SYNC_REF_FLAG	%Qr.m.c.8
FUNCTIONS_ENABLING, %QWr.m.c.0 Word	Implicit	VALID_REF	BOOL	R/W	Operation authorization for the internal preset function	%QWr.m.c.0.1
FUNCTIONS_ENABLING, %QWr.m.c.0 Word	Implicit	VALID_ENABLE	BOOL	R/W	Authorization of the counter enable via the IN_EN input	%QWr.m.c.0.2



D:\My Documents\
01 Ongoing Project

[STR319] support explicit exchange in CANopen function

Status: Negotiable = Must

READ_VAR, WRITE_VAR have been used in Gemasolar program for CANopen SDO.
Identical to embedded serial port of M340 CPU

[STR320] support explicit exchange in Serial link function

Status: Negotiable = Should

Identical to embedded serial port of M340 CPU

[STR321] support explicit exchange in HSC function

Status: Negotiable = Must

WRITE_PARAM has been used in Gemasolar program for HSC.

Need WRITE_PARAM, READ_PARAM, SAVE_PARAM, RESTORE_PARAM, or other EF that provide equivalent functions.

[STR322] support explicit exchange in Analog/Digital I/O function

Status: Negotiable = May

Such as: Calibration for Analog output, Reactivation for Digital output

5.4.4 I/O adjustment

I/O adjustment means customer can adjust parameters in application, while the program is running

[STR323] Support adjust HSC parameters

Status: Negotiable = Must

Operation Mode	Adjust parameter
Event Counting Mode	None
Free Large Counter Mode	Preset
	Hysteresis(slack)
Frequency Mode	Calibration
Modulo Loop Counter Mode	Modulo
One Shot Counter Mode	Preset
Period Measuring Mode	None
Pulse Width Modulation Mode	None
Ratio Mode1	Calibration
Ratio Mode2	Calibration

[STR324] Support adjust CANopen parameters

Status: Negotiable = Must

[STR325] Support adjust Serial line parameters

Status: Negotiable = Must

5.5 Quality Ranges

< Text to write >

5.6 Documentation Requirements

[STR336] All relevant documents, such as User Manual, catalog and Essential brochure are updated

Status: Negotiable = Must