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# Usage of unbundled S500 safety I/Os and AC500-S F_iPar_CRC Calculator

S500 safety I/Os DI581-S (-XC) and DX581-S (-XC) can be used with third-party safety CPUs, e.g., from Siemens, which support PROFINET/PROFIsafe communication. AC500-S F_iPar_CRC Calculator is a software add-on for TIA (Totally Integrated Automation) Portal and SIMATIC Manager from Siemens. It can be used to calculate F_iPar_CRC value to enable safe DI581-S (-XC) and DX581-S (-XC) module and channel parameter configuration in TIA Portal and SIMATIC Manager from Siemens.
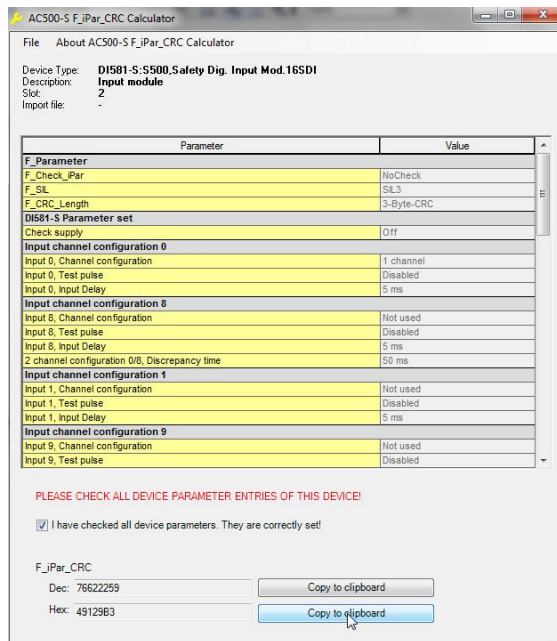


Benefits of using unbundled S500 safety I/Os:

- Save wiring efforts and operation costs;
- Use unique features of S500 safety I/O portfolio to increase your machine productivity:
  o *A single safety I/O channel can be individually reintegrated*, which provides higher machine productivity/availability;
  o *More test pulse outputs on safety digital I/O modules*, which results in higher degree of fault diagnostics, safety integrity and faster reaction;
  o *Each safety I/O channel LED not only indicates the process state but also the fault state*, which saves operation costs and simplifies maintenance work;
  o *Extreme condition (-XC) modules are available (-40 °C to +70 °C, high vibration and shock requirements, etc.)*, which allows cost-savings in engineering and operation;
  o *Front panel rotary switch for PROFIsafe address [1]*, which reduces maintenance efforts because one can see all pre-set PROFIsafe addresses directly looking at the front cover of the module (no need to disassemble safety I/Os to see PROFIsafe address value);
  o *Ability to do wiring on safety I/O terminal units (TU582-S) even if safety I/O modules are not yet available or procured (field wiring and module placement / replacement actions are independent of each other)*, which results in shorter commissioning and maintenance time.

Steps on how to configure S500 safety I/O modules with Siemens safety CPUs in TIA Portal (similar steps can be performed in SIMATIC Manager):

1. Download and install up-to-date ABB GSDML file from www.abb.com/PLC in to TIA Portal;
2. Download and install AC500-S F_iPar_CRC Calculator from www.abb.com/PLC on your PC;
3. Instantiate ABB CI50x-PNIO PROFINET IO-Device communication module (*x* depends on the selected module type) to the selected Siemens safety CPU with PROFINET/PROFIsafe interface in TIA Portal;
4. Set PROFINET device name for CI50x-PNIO and relevant PROFINET parameters in TIA Portal;

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5. Attach DX581-S (-XC) and/or DI581-S (-XC) safety I/O module(s) to CI50x-PNIO communication module (standard S500 I/O modules can be attached as well); Maximum 10 I/O modules can be attached;

6. Configure PROFIsafe F-Parameters (refer to [1] for more details) for DX581-S (-XC) and/or DI581-S (-XC) safety I/O modules;

7. Set module and channel parameters (so-called iParameters, refer also to [1]) for all AC500 and AC500-S I/O modules; Make sure that only valid channel configurations are used for DX581-S (-XC) and/or DI581-S (-XC) safety I/O modules to avoid configuration errors, as it is specified in [2];

8. Make sure that all module and channel parameters (iParameters) and destination addresses F_Dest_Add (part of PROFIsafe F-Parameters) are correctly set; Calculate F_iPar_CRC value for given module and channel parameter configurations of DX581-S (-XC) and/or DI581-S (-XC) modules by starting AC500-S F_iPar_CRC Calculator for selected DX581-S (-XC) or DI581-S (-XC) module, as it is shown below (select "Start device tool…" and then "calculate F_iPar_CRC"):
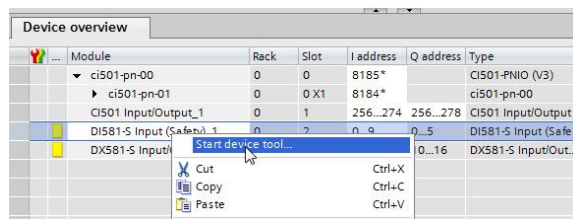


9. In the AC500-S F-iPar_CRC Calculation window, check all device parameters for their correctness and activate the check box "I have checked all device parameters. They are correctly set!"

10. Copy the calculated F_iPar_CRC value from AC500-S F_iPar_CRC Calculator and paste it to the PROFIsafe F-Parameter F_iPar_CRC for the given DX581-S (-XC) or DI581-S (-XC) module in TIA Portal; Close AC500-S F_iPar_CRC Calculator and save the TIA Portal project; Do this operation for all DX581-S (-XC) and/or DI581-S (-XC) modules; The configuration of S500 safety I/Os is complete now.

Various aspects to consider when S500 safety I/Os are used with Siemens safety CPUs:

A. Usage of AC500-S safety I/O error codes as PROFINET process alarms in Siemens CPU diagnostic buffer:
   - Implement calls of SFC52(WR_USMSG) and SFB54(RALRM) in OB40 (HW_INT0) on Siemens CPU to transfer S500 safety I/O error codes to Siemens CPU diagnostic buffer; *Contact ABB technical support, if questions arise*;

B. Take into account S500 safety I/O states like INIT, SAFE STOP, RUN (ok), RUN (user acknowledgement request), RUN (module passivation), RUN (channel passivation & reintegration), RUN (module passivation with a command) and transitions between states (refer to [2] for more details) in your application;

C. ABB AC500-S safety PLC uses all PROFIsafe signal names as they are specified in [1]; Siemens safety CPU may use a different notation for PROFIsafe signal names, e.g., PASS_ON as equivalent to Activate_FV_C [1], ACK_REI as equivalent to OA_C [1], PASS_OUT / QBAD as equivalent to FV_activated_S [1] and ACK_REQ as equivalent to OA_Req_S [1];

D. To enable channel-granular passivation and reintegration, S500 safety I/O modules support the following additional safety data for your safety application on Siemens safety CPU:
   - Safe diagnostic bits / bytes as equivalent to Siemens safety CPU QBAD_Bits, which can be used in safety application on Siemens safety CPU;
   - Reintegration request bits/bytes and acknowledge reintegration bits/bytes for S500 safety I/O channels, which can be used in safety application on Siemens safety CPU.

References

1. PROFIsafe System Description, Version November 2010, Order Number 4.342
2. AC500-S Safety User Manual, 3ADR025091M02* (* = sequential version number)

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