

Schneider Electric Security Notification

EcoStruxure™ Control Expert, EcoStruxure™ Process Expert, SCADAPack RemoteConnect™ x70, and Modicon Controllers M580 and M340

13 July 2021 (14 March 2023)

Overview

Schneider Electric is aware of multiple vulnerabilities in its [EcoStruxure™ Control Expert](#), [EcoStruxure™ Process Expert](#), [SCADAPack RemoteConnect™ x70](#), and [Modicon M580](#) and [M340](#) control products. These vulnerabilities pose several risks, primary among these is the possibility of arbitrary code execution and loss of confidentiality and integrity of the project file.

With all products affected an attack would first involve an authenticated user gaining access to the engineering station; or an unauthenticated user gaining access to a project file or to the process control network.

Our findings demonstrate that while the discovered vulnerabilities affect Schneider Electric offers, it is possible to mitigate the potential impacts by following standard guidance, specific instructions; and in some cases, the fixes provided by Schneider Electric to remove the vulnerabilities.

Please ensure that if you are an EcoStruxure™ Control Expert user to apply the latest security updates provided below. For users of any of the mentioned products see the mitigation section in this security notice for further information on how to help protect your system from possible attack.

Schneider Electric encourages all industrial companies to ensure they have implemented cybersecurity best practices across their operations and supply chains to reduce cyber risks. Where appropriate this includes locating industrial systems and remotely accessible devices behind firewalls; installing physical controls to prevent unauthorized access; preventing mission-critical systems and devices from being accessed from outside networks; systematically applying security patches.

March 2023 Update: Remediation for the Modicon M580 CPU is available for download ([page 8](#)).

We will update this document when the fixes are available. To ensure you are informed of the upcoming security notifications updates, subscribe to Schneider Electric's security notification service here: <https://www.se.com/en/work/support/cybersecurity/security-notifications.jsp>

Note: A Proof-of-Concept script code that could potentially exploit some of these vulnerabilities has been discovered. Remediation and mitigation actions documented in this notification document will reduce the risk of exploit.

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Affected Products & Versions

Affected Products & Versions	CVE-					
	2021-22778	2021-22779	2021-22780	2021-22781	2021-22782	2020-12525
EcoStruxure™ Control Expert V15.0 SP1		X				X
EcoStruxure™ Control Expert , all versions prior to V15.0 SP1 Including all versions of Unity Pro (former name of EcoStruxure™ Control Expert)	X	X	X	X	X	X
EcoStruxure™ Process Expert , all versions prior to V2021 Including all versions of EcoStruxure™ Hybrid DCS (former name of EcoStruxure™ Process Expert)	X	X	X	X	X	X
SCADAPack RemoteConnect™ for x70 , all versions prior to R2.7.3	X		X			X
Modicon M580 CPU (part numbers BMEP* and BMEH*, excluding M580 CPU Safety), Versions prior to SV4.10		X				
Modicon M580 CPU Safety (part numbers BMEP58*S and BMEH58*S), all versions		X				
Modicon M340 CPU (part numbers BMXP34*), versions prior to V3.50		X				

Vulnerability Details

CVE ID: **CVE-2021-22779**

CVSS v3.1 Base Score 9.8 | Critical | CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:U/C:H/I:H/A:H

A *CWE-290: Authentication Bypass by Spoofing* vulnerability exists that could cause unauthorized access in read and write mode to the controller by spoofing the Modbus communication between the engineering software and the controller.

CVE ID: **CVE-2021-22778**

CVSS v3.1 Base Score 8.6 | High | CVSS:3.1/AV:L/AC:L/PR:N/UI:R/S:C/C:H/I:H/A:H

A *CWE-522: Insufficiently Protected Credentials* vulnerability exists that could cause protected derived function blocks to be read or modified by unauthorized users when accessing a project file.

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CVE ID: **CVE-2020-12525**

CVSS v3.1 Base Score 7.3 | High | CVSS:3.1/AV:L/AC:L/PR:L/UI:R/S:U/C:H/I:H/A:H

M&M Software fdtCONTAINER Component in versions below 3.5.20304.x and between 3.6 and 3.6.20304.x is vulnerable to deserialization of untrusted data in its project storage.

Note: This vulnerability could cause local code execution on the engineering workstation when a malicious project file is loaded into the engineering software.

CVE ID: **CVE-2021-22780**

CVSS v3.1 Base Score 7.1 | High | CVSS:3.1/AV:L/AC:L/PR:L/UI:N/S:U/C:H/I:H/A:N

A *CWE-522: Insufficiently Protected Credentials* vulnerability exists that could cause unauthorized access to a project file protected by a password when this file is shared with untrusted sources. An attacker may bypass the password protection and be able to view and modify a project file.

CVE ID: **CVE-2021-22781**

CVSS v3.1 Base Score 6.2 | Medium | CVSS:3.1/AV:L/AC:L/PR:N/UI:N/S:U/C:H/I:N/A:N

A *CWE-522: Insufficiently Protected Credentials* vulnerability exists that could cause a leak of SMTP credential used for mailbox authentication when an attacker can access a project file.

CVE ID: **CVE-2021-22782**

CVSS v3.1 Base Score 6.2 | Medium | CVSS:3.1/AV:L/AC:L/PR:N/UI:N/S:U/C:H/I:N/A:N

A *CWE-311: Missing Encryption of Sensitive Data* vulnerability exists that could cause an information leak allowing disclosure of network and process information, credentials, or intellectual property when an attacker can access a project file.

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Remediations & Mitigations

Affected Product & Version	Remediation & Mitigations
<p>EcoStruxure™ Control Expert</p> <p><i>Versions prior to V15.1</i></p> <p><i>Including all versions of Unity Pro (former name of EcoStruxure™ Control Expert)</i></p>	<p>EcoStruxure™ Control Expert V15.1*, available for download below, includes a fix for CVE-2021-22778, CVE-2021-22780, CVE-2021-22781, CVE-2021-22782, CVE-2020-12525, and CVE-2021-22779: https://www.se.com/ww/en/download/document/EcoStruxureControlExpert_V15.1/</p> <p>* Upgrading to EcoStruxure™ Control Expert V15.1 is the first step in a two steps process to fully address CVE-2021-22779. The second step is to update the firmware of the Modicon Controllers referenced.</p> <p>Important Note:</p> <ul style="list-style-type: none"> • The fix is provided through the additional feature “file encryption”, for further information on the feature and how to set it up please refers to the chapter “file encryption” of the help file available in the EcoStruxure™ Control Expert v15.0 SP1. • This feature is proposed by default when creating a new project. • This feature is also available, after selecting “project” in structural view, in the “Edit/ Properties/ Project & Controller Protection” menu. • For new projects: Customers are recommended to apply this feature to all new projects. • For existing projects: Customers are recommended to apply this feature to the existing projects coming from trusted source. For sta project files, as a reminder, project modification can be done in connected mode to prevent desynchronization and keep the controller in RUN state. • It is possible to set a security level specific to the Derived Function Blocks (DFB) in addition to the file encryption feature. Please refer to the chapter "How to protect a DFB type" in the EcoStruxure™ Control Expert help file for further information. • Customers are recommended to share project files only when configured with the encryption feature described above. <p>If customers choose not to apply the remediation provided above, they should immediately apply the following mitigations to reduce the risk of exploit. These mitigations also reduce the risk of exploit for CVE-2021-22779 on all versions of EcoStruxure™ Control Expert, including V15.1:</p> <ul style="list-style-type: none"> • Store the project files in a secure storage and restrict the access to only trusted users • When exchanging files over the network, use secure communication protocols • Encrypt project files when stored • Only open project files received from trusted source • Compute a hash of the project files and regularly check the consistency of this hash to verify the integrity before usage

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	<ul style="list-style-type: none"> • Harden the workstation running EcoStruxure™ Control Expert or Unity Pro <p>Customers using Unity Pro should strongly consider migrating to EcoStruxure™ Control Expert. Please contact your local Schneider Electric technical support for more information.</p>
<p>EcoStruxure™ Process Expert</p> <p><i>Versions prior to V2021</i></p> <p><i>Including all versions of EcoStruxure™ Hybrid DCS (former name of EcoStruxure™ Process Expert)</i></p>	<p>EcoStruxure™ Process Expert V2021*, available for download below, includes a fix for CVE-2021-22778, CVE-2021-22780, CVE-2021-22781, CVE-2021-22782, CVE-2020-12525, and CVE-2021-22779:</p> <p>https://www.se.com/myschneider/documentsDownloadCenterDetail/in/en/EPE2021Release</p> <p>It is recommended to first review the ReadMe in its entirety before proceeding with the software installation.</p> <p>* Upgrading to EcoStruxure™ Process Expert V2021 is the first step in a two steps process to fully address CVE-2021-22779. The second step is to update the firmware of the Modicon Controllers referenced.</p> <p>Important Note:</p> <ul style="list-style-type: none"> • Refer to the instructions provided for EcoStruxure™ Control Expert. <p>We strongly recommend the use of back-ups and evaluating the impact of these patches in a Test and Development environment or on an offline infrastructure. Contact Schneider Electric's Customer Care Center if you need assistance removing a patch.</p> <p>If customers choose not to apply the remediation provided above, they should immediately apply the following mitigations to reduce the risk of exploit. These mitigations also reduce the risk of exploit for CVE-2021-22779 on all versions of EcoStruxure™ Process Expert:</p> <ul style="list-style-type: none"> • Store the project files in a secure storage and restrict the access to only trusted users • When exchanging files over the network, use secure communication protocols • Encrypt project files when stored • Only open project files received from trusted source • Compute a hash of the project files and regularly check the consistency of this hash to verify the integrity before usage • Harden the workstation running EcoStruxure™ Process Expert <p>To ensure you are informed of all security notifications updates, subscribe to Schneider Electric's security notification service here: https://www.se.com/en/work/support/cybersecurity/security-notifications.jsp</p>

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<p>SCADAPack RemoteConnect™</p> <p><i>Versions prior to R2.7.3</i></p>	<p>Version R2.7.3 of SCADAPack RemoteConnect™, available for download below, includes a fix for CVE-2021-22778, CVE-2021-22780, and CVE-2020-12525: RemoteConnect for the SCADAPack x70 Schneider Electric Exchange Marketplace (se.com)</p> <p>Important Note:</p> <ul style="list-style-type: none"> • Refer to the instructions provided for EcoStruxure™ Control Expert. <p>We strongly recommend the use of back-ups and evaluating the impact of these patches in a Test and Development environment or on an offline infrastructure. Contact Schneider Electric's Customer Care Center if you need assistance removing a patch.</p> <p>Note: Users no longer need to update the RemoteConnect™ application when there is a Control Expert update.</p> <p>If customers choose not to apply the remediation provided above, they should immediately apply the following mitigations to reduce the risk of exploit:</p> <ul style="list-style-type: none"> • Store the project files in a secure storage and restrict the access to only trusted users • When exchanging files over the network, use secure communication protocols • Encrypt project files when stored • Only open project files received from trusted source • Compute a hash of the project files and regularly check the consistency of this hash to verify the integrity before usage • Harden the workstation running SCADAPack RemoteConnect™
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<p>Modicon M340 CPU (part numbers BMXP34*)</p> <p><i>Versions prior to V3.50</i></p>	<p>Version 3.50 of Modicon M340 is available for download below, includes a fix for CVE-2021-22779:</p> <p>https://www.se.com/ww/en/download/document/BMXP34xxxxx_SV_03.50/</p> <p>Note: It is recommended alongside to following the remediation provided for EcoStruxure™ Control Expert and make use of application password to ensure complete remediation of this issue.</p> <p>If customers choose not to apply the remediation provided above, they should immediately apply the following mitigations to reduce the risk of exploit:</p> <p>Modicon M340:</p> <ul style="list-style-type: none"> • Setup network segmentation and implement a firewall to block all unauthorized access to port 502/TCP • Configure the Access Control List following the recommendations of the user manual “Modicon M340 for Ethernet Communications Modules and Processors User Manual” in chapter “Messaging Configuration Parameters”: https://www.se.com/ww/en/download/document/31007131K01000/ • Setup a VPN between the Modicon PLC impacted modules and the engineering workstation containing EcoStruxure™ Control Expert or Process Expert.
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<p>Modicon M580 CPU (part numbers BMEP* and BMEH*, excluding M580 CPU Safety)</p> <p><i>Versions prior to SV4.10</i></p>	<p>Firmware SV4.10 includes a fix for CVE-2021-22779 vulnerability and is available for download here: https://www.se.com/ww/en/download/document/BMEx58x0x0_SV04.10/</p> <p>If customers choose not to apply the remediation then they are encouraged to immediately apply the following mitigations to reduce the risk of exploit::</p> <ul style="list-style-type: none"> • Setup network segmentation and implement a firewall to block all unauthorized access to port 502/TCP • Configure the Access Control List following the recommendations of the user manual “Modicon M580, Hardware, Reference Manual”: https://www.se.com/ww/en/download/document/EIO0000001578/ • Setup a secure communication according to the following guideline “Modicon Controllers Platform Cyber Security Reference Manual,” in chapter “Setup secured communications”: https://www.se.com/ww/en/download/document/EIO0000001999/ • Use a BMENOC module and follow the instructions to configure IPSEC feature as described in the guideline “Modicon M580 – BMENOC03.1 Ethernet Communications Schneider Electric Security Notification Module, Installation and Configuration Guide” in the chapter “Configuring IPSEC communications”: https://www.se.com/ww/en/download/document/HRB62665/ • Setup a VPN between the Modicon PLC impacted modules and the engineering workstation containing EcoStruxure™ Control Expert or Process Expert. • Ensure the CPU is running with the memory protection activated by configuring the input bit to a physical input , for more details refer to the following guideline “Modicon Controllers Platform Cyber Security Reference Manual”, “CPU Memory Protection section”: https://www.schneider-electric.com/en/download/document/EIO0000001999/ <ul style="list-style-type: none"> ○ NOTE: The CPU memory protection cannot be configured with Hot Standby CPUs. In such cases, use IPsec encrypted communication
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<p>Modicon M580 CPU Safety (part numbers BMEP58*S and BMEH58*S)</p> <p><i>All versions</i></p>	<p>Schneider Electric is establishing a remediation plan for all future versions of Modicon M580 CPU Safety that will include a fix for this vulnerability. We will update this document when the remediation is available. Until then, customers should immediately apply the following mitigations to reduce the risk of exploit:</p> <ul style="list-style-type: none"> • Setup network segmentation and implement a firewall to block all unauthorized access to port 502/TCP • Configure the Access Control List following the recommendations of the user manual “Modicon M580, Hardware, Reference Manual”: https://www.se.com/ww/en/download/document/EIO0000001578/ • Setup a secure communication according to the following guideline “Modicon Controllers Platform Cyber Security Reference Manual,” in chapter “Setup secured communications”: https://www.se.com/ww/en/download/document/EIO0000001999/ • Use a BMENUA0100 module and follow the instructions to configure IPSEC feature as described in the chapter “Configuring the BMENUA0100 Cybersecurity Settings”: https://www.se.com/ww/en/download/document/PHA83350 • Use a BMENOC module and follow the instructions to configure IPSEC feature as described in the guideline “Modicon M580 – BMENOC03.1 Ethernet Communications Schneider Electric Security Notification Module, Installation and Configuration Guide” in the chapter “Configuring IPSEC communications”: https://www.se.com/ww/en/download/document/HRB62665/ • Setup a VPN between the Modicon PLC impacted modules and the engineering workstation containing EcoStruxure™ Control Expert or Process Expert. <p>To further reduce the attack surface on Modicon M580 CPU Safety:</p> <ul style="list-style-type: none"> • Ensure the CPU is running in Safety mode and maintenance input is configured to maintain this Safety mode during operation – refer to the document Modicon M580 - Safety System Planning Guide - in the chapter “Operating Mode Transitions”: https://www.se.com/ww/en/download/document/QGH60283/
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To ensure you are informed of all security notifications updates, subscribe to Schneider Electric’s security notification service here:

<https://www.se.com/en/work/support/cybersecurity/security-notifications.jsp>

We strongly recommend the use of back-ups and evaluating the impact of these patches in a Test and Development environment or on an offline infrastructure. Contact [Schneider Electric’s Customer Care Center](#) if you need assistance removing a patch.

General Security Recommendations

We strongly recommend the following industry cybersecurity best practices.

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- Ensure the cybersecurity features in Schneider Electric solutions are always enabled.
- Locate control and safety system networks and remote devices behind firewalls and isolate them from the business network.
- Install physical controls so no unauthorized personnel can access your industrial control and safety systems, components, peripheral equipment, and networks.
- Place all controllers in locked cabinets and when applicable do not leave them in the “Program” mode.
- Never connect programming software and engineering workstations to any network other than the network that it is intended.
- ICS networks should be appropriately partitioned, and not directly connected to business networks or the Internet.
- Scan all methods of mobile data exchange with the isolated network such as CDs, USB drives, etc. before use in the terminals or any node connected to these networks.
- Never allow mobile devices that have connected to any other network besides the intended network to connect to the safety or control networks without proper sanitation.
- Minimize network exposure for all control system devices and systems and ensure that they are not accessible from the Internet.
- When remote access is required, use secure methods, such as Virtual Private Networks (VPNs). Recognize that VPNs may have vulnerabilities and should be updated to the most current version available. Also, understand that VPNs are only as secure as the connected devices.
- Customers are encouraged to implement best practices covered in the [Top 20 Secure PLC Coding Practices](#) to help improve the security posture of their Industrial Control Systems.

For more information refer to the Schneider Electric [Recommended Cybersecurity Best Practices](#) document.

Acknowledgements

Schneider Electric recognizes the following researchers for identifying and helping to coordinate a response to these vulnerabilities:

CVE	Researchers
CVE-2021-22779	Kai Wang (Fortinet’s FortiGuard Labs) Nicholas Miles (Tenable) Andrey Muravitsky (Kaspersky ICS CERT) Gal Kauffman (Armis) Li Wei (Friday Lab – Boleam Tech)
CVE-2021-22780	Kai Wang (Fortinet’s FortiGuard Labs) Maxim Tumakov (Kaspersky ICS CERT)

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CVE-2021-22781	Kai Wang (Codesafe Team of Legendsec at Qi'anxin Group)
CVE-2021-22782	Maxim Tumakov (Kaspersky ICS CERT)

For More Information

This document provides an overview of the identified vulnerability or vulnerabilities and actions required to mitigate. For more details and assistance on how to protect your installation, contact your local Schneider Electric representative or Schneider Electric Industrial Cybersecurity Services. These organizations will be fully aware of this situation and can support you through the process.

<https://www.se.com/ww/en/work/support/cybersecurity/overview.jsp>

<https://www.se.com/ww/en/work/services/field-services/industrial-automation/industrial-cybersecurity/industrial-cybersecurity.jsp>

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Schneider's purpose is to empower all to make the most of our energy and resources, bridging progress and sustainability for all. We call this Life Is On.

Our mission is to be your digital partner for Sustainability and Efficiency.

We drive digital transformation by integrating world-leading process and energy technologies, end-point to cloud connecting products, controls, software and services, across the entire lifecycle, enabling integrated company management, for homes, buildings, data centers, infrastructure and industries.

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We are the most local of global companies. We are advocates of open standards and partnership ecosystems that are passionate about our shared Meaningful Purpose, Inclusive and Empowered values.

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Revision Control:

<p>Version 1.0 13 Jul 2021</p>	<p>Original Release</p>
<p>Version 2.0 08 March 2022</p>	<p>A release is available for EcoStruxure™ Control Expert v15.1 and EcoStruxure™ Process Expert 2021 that addresses workstation vulnerabilities related to the issues listed below. A subsequent release is planned to address the Modicon M580 and Modicon M340 PLC's to complete the remediations.</p>
<p>Version 3.0 12 April 2022</p>	<p>A release is available for Modicon M340 controllers that addresses CVE-2021-22779, in conjunction with the latest release of EcoStruxure™ Control Expert. Subsequent firmware releases are planned to address the Modicon M580 PLC's to complete the remediations that will fix CVE-2021-22779.</p>
<p>Version 4.0 12 July 2022</p>	<p>A release is available for SCADAPack RemoteConnect™ R2.7.3 that addresses workstation vulnerabilities related to the issues listed. (page 6) It has been determined that SCADAPack RemoteConnect™ versions prior to R2.7.3 are not affected by CVE-2021-22779, CVE-2021-22781, CVE-2021-22782.</p>
<p>Version 5.0 09 August 2022</p>	<p>A fix is available for Modicon M580 CPU (part numbers BMEP* and BMEH*).</p> <p>Note that a complete remediation is a two-step process and will require an upgrade of the engineering software: EcoStruxure™ Control Expert, EcoStruxure™ Process Expert or SCADAPack RemoteConnect™, in addition to an upgrade of the Modicon controller firmware: M340 and M580.</p> <p>EcoStruxure™ Control Expert V15.1 and EcoStruxure™ Process Expert V2021 include a fix for the vulnerabilities reported in this document and have been removed from the affected products list.</p>
<p>Version 5.1 06 September 2022</p>	<p>The version number for Modicon M580 that addresses these vulnerabilities has been updated from SV4.01 to SV4.02.</p>
<p>Version 6.0 11 October 2022</p>	<p>Adding a clarification to the list of affected products by splitting Modicon M580 and Modicon M580 Safety CPU ranges. The purpose of the notification update is to inform customers that the latest fix Modicon M580 SV4.02 does not apply to the Safety range of M580. It is highly recommended that customers using Modicon M580 Safety ranges continue to implement the mitigations shared in this document.</p>

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Version 7.0 <i>13 December 2022</i>	The Modicon M580 SV4.02 firmware has been retracted for quality issues and is no longer available for download. Additional mitigations have been introduced for Modicon M580 CPU and M580 CPU Safety, and we urge customers to deploy these mitigations to further reduce the risk of potential exploitation of identified vulnerabilities (page 8 and 9).
Version 8.0 <i>March 2023</i>	Remediation for the Modicon M580 CPU is available for download (page 8).