Communication manual

Powering Business Worldwide

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Cover Photo: Eaton PowerXL™ series DX1 drives

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Support services

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Safety

⚠ WARNING

Dangerous electrical voltage

Before commencing the installation

- Disconnect the power supply of the device
- Ensure that devices cannot be accidentally restarted
- Verify isolation from the supply
- Earth and short circuit the device
- Cover or enclose any adjacent live components
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system
- Before installation and before touching the device ensure that you are free of electrostatic charge
- The functional earth (FE, PES) must be connected to the protective earth (PE) or the potential equalization. The system installer is responsible for implementing this connection
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automation functions
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation
- Suitable safety hardware and software measures should be implemented for the I/O interface so that an open circuit on the signal side does not result in undefined states in the automation devices
- Ensure a reliable electrical isolation of the extra-low voltage of the 24V supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD384.4.41 S2 Power supply shall have a maximum 60Vdc fault limit according to SELV/PELV
- Deviations of the input voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause a restart
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed and with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage DIP or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented
- Wherever faults in the automation system may cause injury or material damage, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks, and so on)
- Depending on their degree of protection, adjustable frequency drives may contain live bright metal parts, moving or rotating components, or hot surfaces during and immediately after operation
- Removal of the required covers, improper installation, or incorrect operation of motor or adjustable frequency drive may cause the failure of the device and may lead to serious injury or damage
- The applicable national accident prevention and safety regulations apply to all work carried out on live adjustable frequency drives
- The electrical installation must be carried out in accordance with the relevant regulations (for example, with regard to cable cross sections, fuses, PE)
- Transport, installation, commissioning, and maintenance work must be carried out only by qualified personnel (IEC 60364, HD 384 and national occupational safety regulations)
- Installations containing adjustable frequency drives must be provided with additional monitoring and protective devices in accordance with the applicable safety regulations. Modifications to the variable frequency drives using the operating software are permitted
- All covers and doors must be kept closed during operation
- To reduce hazards for people or equipment, the user must include in the machine design measures that restrict the consequences of a malfunction or failure of the drive (increased motor speed or sudden standstill of motor). These measures include:

  a. Other independent devices for monitoring safety-related variables (speed, travel, end positions, and so on)

  b. Electrical or non-electrical system-wide measures (electrical or mechanical interlocks)

  c. Never touch live parts or cable connections of the adjustable frequency drive after it has been disconnected from the power supply. Due to the charge in the capacitors, these parts may still be live after disconnection. Fit appropriate warning signs

Read this manual thoroughly and make sure you understand the procedures before you attempt to install, set up, operate or carry out any maintenance work on this variable frequency drive.

Definitions and symbols

⚠ WARNING

This symbol indicates high voltage. It calls your attention to items or operations that could be dangerous to you and other persons operating this equipment. Read the message and follow the instructions carefully.

⚠

This symbol is the "Safety Alert Symbol." It occurs with either of two signal words: CAUTION or WARNING, as described below.

⚠ WARNING

Indicates a potentially hazardous situation which, if not avoided, can result in serious injury or death.

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, can result in minor to moderate injury, or serious damage to the product. The situation described in the CAUTION may, if not avoided, lead to serious results. Important safety measures are described in CAUTION (as well as WARNING).

Hazardous high voltage

⚠ WARNING

Motor control equipment and electronic controllers are connected to hazardous line voltages. When servicing drives and electronic controllers, there may be exposed components with housings or protrusions at or above line potential. Extreme care should be taken to protect against shock.

- **Stand on an insulating pad and make it a habit to use only one hand when checking components**
- **Always work with another person in case an emergency occurs**
- **Disconnect power before checking controllers or performing maintenance**
- **Be sure equipment is properly earthed**
- **Wear safety glasses whenever working on electronic controllers or rotating machinery**

⚠ WARNING

The components in the drive's power section remain Energized after the supply voltage has been switched Off. After disconnecting the supply, wait at least Five minutes before removing the cover to allow the Intermediate circuit capacitors to discharge.

Pay attention to hazard warnings!

⚠ WARNING

The components in the drive's power section remain energized after the supply voltage has been switched off. After disconnecting the supply, wait at least five minutes before removing the cover to allow the intermediate circuit capacitors to discharge.

Pay attention to hazard warnings!

DANGER
5 MIN

⚠ WARNING

Electric shock hazard—risk of injuries! Carry out wiring work only if the unit is de-energized.

⚠ WARNING

Do not perform any modifications on the AC drive when it is connected to mains.

Warnings and cautions

⚠ WARNING

Be sure to ground the unit following the instructions in this manual. Ungrounded units may cause electric shock and/or fire.

⚠ WARNING

This equipment should only be installed, adjusted, and serviced by qualified electrical maintenance personnel familiar with the construction and operation of this type of equipment and the hazards involved. Failure to observe this precaution could result in death or severe injury.

⚠ WARNING

Line terminals (L1, L2, L3), motor terminals (U, V, W) and the DC link/ brake resistor terminals (DC–, DC+/R+, R–) are live when the drive is connected to power, even if the motor is not running. Contact with this voltage is extremely dangerous and may cause death or severe injury.

⚠ WARNING

Components within the drive are live when it is connected to power. Contact with this voltage is extremely dangerous and may cause death or severe injury.

⚠ WARNING

Even though the control I/O-terminals are isolated from line voltage, the relay outputs and other I/O-terminals may have dangerous voltage present even when the drive is disconnected from power. Contact with this voltage is extremely dangerous and may cause death or severe injury.

⚠ WARNING

This equipment has a large capacitive leakage current during operation, which can cause enclosure parts to be above ground potential. Proper grounding, as described in this manual, is required. Failure to observe this precaution could result in death or severe injury.

⚠ WARNING

Before applying power to this drive, make sure that the front and cable covers are closed and fastened to prevent exposure to potential electrical fault conditions. Failure to observe this precaution could result in death or severe injury.

⚠ WARNING

An upstream disconnect/protective device must be provided as required by the National Electric Code® (NEC®). Failure to follow this precaution may result in death or severe injury.

⚠ WARNING

This drive can cause a DC current in the protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product.

⚠ WARNING

Carry out wiring work only after the drive has been correctly mounted and secured.

⚠ WARNING

Before opening the drive covers:

- **Disconnect all power to the drive, including external control power that may be present**
- **Wait a minimum of five minutes after all the lights on the keypad are off. This allows time for the DC bus capacitors to discharge**
- **A hazard voltage may still remain in the DC bus capacitors even if the power has been turned off. Confirm that the capacitors have fully discharged by measuring their voltage using a multimeter set to measure the DC voltage**
- **Failure to follow these precautions may cause death or severe injury**

⚠ WARNING

The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

⚠ WARNING

Operation of this equipment requires detailed installation and operation instructions provided in the Installation/Operation manual intended for use with this product.

⚠ WARNING

Before servicing the drive:

- **Disconnect all power to the drive, including external control power that may be present**
- **Place a "DO NOT TURN ON" label on the disconnect device**
- **Lock the disconnect device in the open position**

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

The drive outputs (U, V, W) must not be connected to the input voltage or the utility line power as severe damage to the device may occur and there may be a risk of fire.

⚠ WARNING

The heat sink and/or outer enclosure may reach a high temperature.

Pay attention to hazard warnings!

Hot Surface—Risk of Burn. DO NOT TOUCH!

⚠ CAUTION

Any electrical or mechanical modification to this drive without prior written consent of manufacturer will void all warranties and may result in a safety hazard in addition and voiding of the UL® listing.

⚠ CAUTION

Install this drive on flame-resistant material such as a steel plate to reduce the risk of fire.

⚠ CAUTION

Install this drive on a perpendicular surface that is able to support the weight of the drive and is not subject to vibration, to lessen the risk of the drive falling and being damaged and/or causing personal injury.

⚠ CAUTION

Prevent foreign material such as wire clippings or metal shavings from entering the drive enclosure, as this may cause arcing damage and fire.

⚠ CAUTION

Install this drive in a well-ventilated room that is not subject to temperature extremes, high humidity, or condensation, and avoid locations that are directly exposed to sunlight, or have high concentrations of dust, corrosive gas, explosive gas, inflammable gas, grinding fluid mist, etc. Improper installation may result in a fire hazard.

⚠ CAUTION

When selecting the cable cross-section, take the voltage drop under load conditions into account. The consideration of other standards is the responsibility of the user.

The user is responsible for compliance with all international and national electrical standards in force concerning protective grounding of all equipment.

⚠ CAUTION

The specified minimum PE conductor cross-sections in this manual must be maintained.

Touch current in this equipment exceeds 3.5 mA (AC). The minimum size of the protective earthing conductor shall comply with the requirements of EN 61800-5-1 and/or the local safety regulations.

⚠ CAUTION

Touch currents in this frequency inverter are greater than 3.5 mA (AC). According to product standard IEC/EN 61800-5-1, an additional equipment grounding conductor of the same cross-sectional area as the original protective earthing conductor must be connected, or the cross-section of the equipment grounding conductor must be at least 10 mm^2 Cu. Drive requires that only copper conductor should be used.

⚠ CAUTION

Debounced inputs may not be used in the safety circuit diagram. Residual current circuit breakers (RCD) are only to be installed between the AC power supply network and the drive.

⚠ CAUTION

Debounced inputs may not be used in the safety circuit diagram. If you are connecting multiple motors on one drive, you must design the contactors for the individual motors according to utilization category AC-3.

Selecting the motor contactor is done according to the rated operational current of the motor to be connected.

⚠ CAUTION

Debounced inputs may not be used in the safety circuit diagram. A changeover between the drive and the input supply must take place in a voltage-free state.

⚠ CAUTION

Debounced inputs may not be used in the safety circuit diagram. Fire hazard!

Only use cables, protective switches, and contactors that feature the indicated permissible nominal current value.

⚠ CAUTION

Before connecting the drive to AC mains make sure that the EMC protection class settings of the drive are appropriately made according to instructions in this manual.

- **If the drive is to be used in a floating distribution network, remove screws at MOV and EMC**
- **Disconnect the internal EMC filter when installing the drive on an IT system (an ungrounded power system or a high-resistance-grounded [over 30 ohm] power system), otherwise the system will be connected to ground potential through the EMC filter capacitors. This may cause danger, or damage the drive**
- **Disconnect the internal EMC filter when installing the drive on a corner grounded TN system, otherwise the drive will be damaged**

Note: When the internal EMC filter is disconnected, the drive might be not EMC compatible.

- **Do not attempt to install or remove the MOV or EMC screws while power is applied to the drive's input terminals.**

⚠ CAUTION

When the internal emc filter is disconnected, the drive Might be not EMC compatible.

- **Do not attempt to install or remove the MOV or EMC screws while power is applied to the drive's Input terminals**

Motor and equipment safety

⚠ CAUTION

Do not perform any meggar or voltage withstand tests on any part of the drive or its components. Improper testing may result in damage.

⚠ CAUTION

Prior to any tests or measurements of the motor or the motor cable, disconnect the motor cable at the drive output terminals (U, V, W) to avoid damaging the drive during motor or cable testing.

⚠ CAUTION

Do not touch any components on the circuit boards. Static voltage discharge may damage the components.

⚠ CAUTION

Before starting the motor, check that the motor is mounted properly and aligned with the driven equipment. Ensure that starting the motor will not cause personal injury or damage equipment connected to the motor.

⚠ CAUTION

Set the maximum motor speed (frequency) in the drive according to the requirements of the motor and the equipment connected to it. Incorrect maximum frequency settings can cause motor or equipment damage and personal injury.

⚠ CAUTION

Before reversing the motor rotation direction, ensure that this will not cause personal injury or equipment damage.

⚠ CAUTION

Make sure that no power correction capacitors are connected to the drive output or the motor terminals to prevent drive malfunction and potential damage.

⚠ CAUTION

Make sure that the drive output terminals (U, V, W) are not connected to the utility line power as severe damage to the drive may occur.

⚠ CAUTION

When the control terminals of two or more drive units are connected in parallel, the auxiliary voltage for these control connections must be taken from a single source which can either be one of the units or an external supply.

⚠ CAUTION

The drive will start up automatically after an input voltage interruption if the external run command is on.

⚠ CAUTION

Do not control the motor with the disconnecting device (disconnecting means); instead, use the control panel start and stop keys and, or commands via the I/O board of the drive. The maximum allowed number of charging cycles of the DC capacitors (i.e. power-ups by applying power) is five in ten minutes.

⚠ CAUTION

Improper drive operation:

- **If the drive is not turned on for a long period, the performance of its electrolytic capacitors will be reduced**
- **If it is stopped for a prolonged period, turn the drive on at least every six months for at least 5 hours to restore the performance of the capacitors, and then check its operation. It is recommended that the drive is not connected directly to the line voltage. The voltage should be increased gradually using an adjustable AC source**

Failure to follow these instructions can result in injury and/or equipment damage.

⚠ CAUTION

The device has been evaluated to meet general RF exposure requirement. The device can be used in mobile / portable exposure condition without restrictions.

For more technical information, contact the factory or your local sales representative.

Sécurité

⚠ AVERTISSEMENT

Tension électrique dangereuse

Read this manual thoroughly and make sure you understand the procedures before you attempt to install, set up, operate or carry out any maintenance work on this PowerXL DX1 adjustable frequency drive.

Avant de commencer l'installation

- Débrancher l'alimentation de l'appareil
- S'assurer que les dispositifs ne peuvent pas être accidentellement redémarrés
- Vérifier l'isolement de l'alimentation
- Mettre l'appareil à la terre et le protéger contre les courts-circuits
- Couvrir ou enfermer tout composant sous tension adjacent
- Seul le personnel qualifié conformément à la norme EN 50110-1/-2 (VDE 0105 Partie 100) peut travailler sur cet appareil/ce système
- Avant l'installation et avant de toucher l'appareil, s'assurer de ne porter aucune charge électrostatique
- La terre fonctionnelle (FE, PSE) doit être raccordée à la terre de protection (PE) ou la compensation de potentiel. L'installateur du système a la responsabilité d'assurer cette connexion
- Les câbles de connexion et les lignes de signal doivent être installés de façon à ce que les interférences capacitives ou inductives ne compromettent pas les fonctions d'automatisation
- Installer les appareils d'automatisation et les éléments de fonctionnement associés de manière à ce qu'ils soient bien protégés contre tout fonctionnement accidentel
- Des dispositifs de sécurité matériels et logiciels appropriés doivent être utilisés en rapport avec l'interface des E/S afin qu'un circuit ouvert sur le côté signal ne résulte pas en états indéfinis dans les dispositifs d'automatisation
- Assurer une isolation électrique fiable sur le côté tension extra basse de l'alimentation 24 V. Utiliser uniquement des blocs d'alimentation conformes à la norme CEI 60364-4-41 (VDE 0100, partie 410) ou HD384.4.41 S2
- Les écarts entre la tension d'entrée et la tension nominale ne doivent pas dépasser les limites de tolérance indiquées dans les spécifications, au risque de provoquer un mauvais fonctionnement et une utilisation dangereuse du système
- Les dispositifs d'arrêt d'urgence conformes à la norme CEI/EN 60204-1 doivent être efficace dans tous les modes de fonctionnement des dispositifs d'automatisation. Le déverrouillage des dispositifs d'arrêt d'urgence ne doit pas entraîner un redémarrage
- Les dispositifs conçus pour un montage dans des boîtiers ou armoires de commande ne doivent être utilisés et contrôlés qu'après avoir été installés et avec le boîtier fermé. Les unités de bureau ou portatives ne doivent être utilisées et contrôlées que dans leurs boîtiers fermés
- Des mesures doivent être prises pour assurer un bon redémarrage des programmes interrompus après une chute ou une panne de tension. Ceci ne doit pas causer des états de fonctionnement dangereux, même pour un court laps de temps. Si nécessaire, des dispositifs d'arrêt d'urgence doivent être utilisés
- Quand des défaillances du système d'automatisation peuvent entraîner des blessures ou des dommages matériels, des mesures externes doivent être appliquées pour assurer un état de fonctionnement sans danger en cas de panne ou de mauvais fonctionnement (par exemple au moyen de disjoncteurs séparés, de verrouillages mécaniques, etc.)
- En fonction de leur degré de protection, les entraînements à fréquence variable peuvent contenir des pièces métalliques sous tension, des composants rotatifs ou en mouvement et des surfaces brûlantes, pendant le fonctionnement et immédiatement après l'arrêt
- Le retrait des protections requises, une installation incorrecte ou un mauvais fonctionnement du moteur ou de l'entraînement à fréquence variable peuvent causer la défaillance de l'appareil et entraîner des blessures graves et des dommages importants
- La réglementation nationale applicable en matière de sécurité et de prévention des accidents s'applique à tous les travaux effectués sur les entraînements à fréquence variable sous tension
- L'installation électrique doit être effectuée conformément aux réglementations applicables (par exemple, en ce qui concerne les sections transversales des câbles, les fusibles, la mise à la terre de protection)
- Le transport, l'installation, la mise en service et les travaux de maintenance doivent être effectués uniquement par un personnel qualifié (IEC 60364, HD 384 et règles de sécurité du travail)
- Les installations contenant des entraînements à fréquence variable doivent être équipées de dispositifs de surveillance et de protection, conformément aux réglementations applicables en matière de sécurité. Les modifications des entraînements à fréquence variable réalisées à l'aide du logiciel d'exploitation sont autorisées
- Toutes les protections et les portes doivent être maintenues fermées pendant le fonctionnement

- Pour réduire les risques d'accidents et de dommages matériels, l'utilisateur doit inclure dans la conception de la machine des mesures limitant les conséquences de panne ou de mauvais fonctionnement de l'entraînement (augmentation de la vitesse ou arrêt soudain du moteur). Ces mesures comprennent :
  - Autres dispositifs indépendants de surveillance des variables en rapport avec la sécurité (vitesse, voyages, positions d'extrémité, etc.)
  - Mesures électriques ou non électriques appliquées à l'ensemble du système (verrouillages électriques ou mécaniques)
  - Ne jamais toucher les pièces sous tension ni les connexions des câbles de l'entraînement à fréquence variable après leur déconnexion de l'alimentation. En raison de la charge dans les condensateurs, ces pièces peuvent être encore sous tension après la déconnexion. Installer les panneaux d'avertissement appropriés

Lire ce manuel en entier et s'assurer de bien comprendre les procédures avant de tenter d'installer, de configurer, d'utiliser et d'effectuer tout travail d'entretien sur cet entraînement à fréquence variable.

Définitions et symboles

⚠ AVERTISSEMENT

Ce symbole indique une haute tension. Il attire l'attention sur les éléments ou les opérations qui pourraient être dangereux pour les personnes utilisant cet équipement. Lire attentivement le message et suivre attentivement les instructions.

⚠

Ce symbole est le « symbole d'alerte de sécurité ». Il accompagne les deux termes d'avertissement suivants: MISE EN GARDE ou AVERTISSEMENT, comme décrit ci-dessous.

⚠

Indique une situation potentiellement dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures graves ou la mort.

⚠ MISE EN GARDE

Indique une situation potentiellement dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures légères à modérées et d'importants dégâts matériels. La situation décrite dans la MISE EN GARDE peut, si elle n'est pas évitée, entraîner des conséquences graves. Des mesures de sécurité importantes sont décrites dans les MISES EN GARDE (ainsi que dans les AVERTISSEMENTS).

Haute tension dangereuse

⚠ AVERTISSEMENT

L'équipement de contrôle du moteur et les contrôleurs électroniques sont branchés sur des tensions secteur dangereuses. Lors de l'entretien des entraînements et des contrôleurs électroniques, il peut y avoir des composants exposés avec des boîtiers ou des protubérances au niveau du potentiel du réseau ou au-dessus. Toutes les précautions doivent être prises pour se protéger contre les chocs électriques.

- **Se tenir sur un tapis isolant et prendre l'habitude de n'utiliser qu'une seule main pour vérifier les composants**
- **Toujours travailler avec une autre personne lorsqu'une situation d'urgence se produit**
- **Débrancher l'alimentation avant de vérifier les contrôleurs ou d'effectuer des travaux d'entretien**
- **S'assurer que l'équipement est correctement relié à la terre**
- **Porter des lunettes de sécurité lors des travaux sur les contrôleurs électroniques ou les machines rotatives**

⚠ AVERTISSEMENT

Les composants de la section d'alimentation de l'entraînement restent sous tension après la coupure de la tension d'alimentation. Après la déconnexion de l'alimentation, attendre au moins cinq minutes avant de retirer le couvercle pour permettre la décharge des condensateurs du circuit intermédiaire.

Prêter attention aux avertissements signalant des dangers !

DANGER
5 MIN

⚠ AVERTISSEMENT

Risque de choc électrique - risque de blessures ! Effectuer le câblage uniquement si l'unité n'est plus sous tension.

⚠ AVERTISSEMENT

Ne pas effectuer de modifications sur l'entraînement CA lorsqu'il est connecté à l'alimentation secteur.

Avertissements et mises en garde

⚠ AVERTISSEMENT

S'assurer de mettre l'appareil à la terre en suivant les instructions de ce manuel. Les unités non mises à la terre peuvent causer des chocs électriques et des incendies.

⚠ AVERTISSEMENT

Cet équipement ne doit être installé, réglé et entretenu que par un personnel d'entretien électrique qualifié connaissant la construction et le fonctionnement de ce type d'équipement, ainsi que les risques encourus. Le non-respect de cette précaution peut entraîner la mort ou des blessures graves.

⚠ AVERTISSEMENT

Les composants à l'intérieur de l'entraînement sont sous tension lorsque l'entraînement est branché à l'alimentation. Le contact avec cette tension est extrêmement dangereux et peut causer la mort ou des blessures graves.

⚠ AVERTISSEMENT

Les bornes de phase (L1, L2, L3), les bornes du moteur (U, V, W) et les bornes de résistance de liaison CC/frein (DC-, DC+ /R+, R-) sont sous tension lorsque l'entraînement est branché à l'alimentation, même si le moteur ne tourne pas. Le contact avec cette tension est extrêmement dangereux et peut causer la mort ou des blessures graves.

⚠ AVERTISSEMENT

Même si les bornes E/S de commande sont isolées de la tension secteur, les sorties de relais et les autres bornes E/S peuvent présenter une tension dangereuse même lorsque l'entraînement est débranché. Le contact avec cette tension est extrêmement dangereux et peut causer la mort ou des blessures graves.

⚠ AVERTISSEMENT

Cet équipement a un grand courant de fuite capacitif pendant le fonctionnement, ce qui peut mettre les pièces du boîtier à un niveau supérieur au potentiel de terre. Une mise à la terre appropriée, telle que décrite dans ce manuel, est nécessaire. Le non-respect de cette précaution peut entraîner la mort ou des blessures graves.

⚠ AVERTISSEMENT

Avant de mettre l'entraînement sous tension, s'assurer que les protections avant et des câbles sont fermées et attachées pour empêcher l'exposition à d'éventuelles défaillances électriques. Le non-respect de cette précaution peut entraîner la mort ou des blessures graves.

⚠ AVERTISSEMENT

Un dispositif de protection/déconnexion en amont doit être fourni, tel que requis par le code électrique national (NEC®). Le non-respect de cette précaution peut entraîner la mort ou des blessures graves.

⚠ AVERTISSEMENT

Cet entraînement peut causer un courant CC dans le conducteur de mise à la terre de protection. Lorsqu'un dispositif de protection ou de surveillance à courant résiduel est utilisé pour la protection en cas de contact direct ou indirect, seul un dispositif de type B est autorisé sur le côté alimentation de ce produit.

⚠ AVERTISSEMENT

Ne travailler sur le câblage qu'après que l'entraînement a été correctement monté et attaché.

⚠ AVERTISSEMENT

Avant d'ouvrir les couvercles de l'entraînement :

- **Débrancher toute l'alimentation allant à l'entraîne-ment, y compris l'alimentation de commande externe pouvant être présente**
- **Attendre un minimum de cinq minutes après l'extinction de tous les voyants du clavier. Cela permet aux condensateurs de bus CC de se décharger**
- **Une tension dangereuse peut rester dans les condensateurs de bus CC même si l'alimentation a été coupée. Confirmer que les condensateurs sont entièrement déchargés en mesurant la tension à l'aide d'un multimètre réglé pour mesurer la tension CC**
- **Le non-respect de cette précaution peut entraîner la mort ou des blessures graves**

⚠ AVERTISSEMENT

L'ouverture du dispositif de protection du circuit de dérivation peut indiquer que le courant de défaut a été interrompu. Pour réduire le risque d'incendie ou de choc électrique, les pièces porteuses de courant et les autres composants du contrôleur doivent être examinés et remplacés s'ils sont endommagés. Si l'élément de courant d'un relais de surcharge a grillé, le relais de surcharge doit être intégralement remplacé.

⚠ AVERTISSEMENT

Le fonctionnement de cet équipement nécessite le respect des instructions d'installation et de fonctionnement détaillées fournies dans le manuel d'installation/de fonctionnement destiné à être utilisé avec ce produit.

⚠ AVERTISSEMENT

Avant de procéder à l'entretien de l'entraînement :

- **Débrancher toute l'alimentation allant à l'entraîne-ment, y compris l'alimentation de commande externe pouvant être présente**
- **Placer une étiquette « NE PAS UTILISER » sur le dispositif de déconnexion**
- **Verrouiller le dispositif de déconnexion en position ouverte**

Le non-respect de ces instructions peut entraîner la mort ou des blessures graves.

⚠ AVERTISSEMENT

Les sorties de l'entraînement (U, V, W) ne doivent pas être connectées à la tension d'entrée ni à l'alimentation secteur, car ceci pourrait gravement endommager l'appareil et causer un incendie.

⚠ AVERTISSEMENT

Le dissipateur de chaleur et/ou le boîtier externe peuvent atteindre une température élevée.

Prêter attention aux avertissements signalant des dangers !

Surface brûlante - Risque de brûlure. NE PAS TOUCHER !

⚠ MISE EN GARDE

Toute modification électrique ou mécanique de cet entraînement sans consentement écrit préalable fabricar annule toutes les garanties, peut entraîner un danger pour la sécurité et annuler l'homologation UL®.

⚠ MISE EN GARDE

Installer cet entraînement sur une matière résistante aux flammes, telle qu'une plaque d'acier, pour réduire les risques d'incendie.

⚠ MISE EN GARDE

Installer cet entraînement sur une surface perpendiculaire capable de supporter le poids de l'entraînement et non soumise à des vibrations afin de diminuer les risques de chute et de dommage de l'entraînement, ainsi que les risques de blessures.

⚠ MISE EN GARDE

Empêcher la pénétration de corps étrangers, tels que morceaux de fils et copeaux métalliques, dans le boîtier de l'entraînement, car ceci pourrait provoquer la formation d'un arc électrique et un incendie.

⚠ MISE EN GARDE

Installer cet entraînement dans une pièce bien aérée non soumise à des températures extrêmes, à une forte humidité ou à la condensation. Éviter les endroits directement exposés au soleil ou présentant de fortes concentrations de poussières, des gaz corrosifs, des gaz explosifs, des gaz inflammables, ou des vapeurs de liquide de meulage, etc. Une installation inadéquate peut entraîner un risque d'incendie.

⚠ MISE EN GARDE

Lors de la sélection de la section transversale des câbles, prendre en compte la chute de tension dans des conditions de charge. La prise en compte d'autres paramètres relève de la responsabilité de l'utilisateur.

Il relève de la responsabilité de l'utilisateur de respecter toutes les normes électriques nationales et internationales en vigueur concernant la mise à la terre de protection de l'ensemble de l'équipement.

⚠ MISE EN GARDE

Les spécifications minimum relatives aux sections transversales des conducteurs de terre de protection indiquées dans ce manuel doivent être respectées.

Le courant de fuite de cet équipement dépasse 3,5 mA (CA). La taille minimum du conducteur de la mise à la terre de protection doit être conforme aux exigences de la norme EN 61800-5-1 et/ou aux réglementations de sécurité locales.

⚠ MISE EN GARDE

Les courants de fuite de ce convertisseur de fréquence sont supérieures à 3,5 mA (CA). Conformément à la norme CEI/EN 61800-5-1, un conducteur de mise à la terre de l'équipement supplémentaire possédant la même superficie de coupe transversale que le conducteur de mise à la terre de protection d'origine doit être branché, ou la section transversale du conducteur de mise à la terre de l'équipement doit être d'au moins 10 mm² Cu. Seul un conducteur en cuivre doit être utilisé avec cet entraînement.

⚠ MISE EN GARDE

Les entrées anti-rebond ne sont pas permises dans le schéma du circuit de sécurité. Des disjoncteurs de courant résiduel (RCD) ne peuvent être installés qu'entre le réseau de courant alternatif et l'entraînement.

⚠ MISE EN GARDE

Les entrées anti-rebond ne sont pas permises dans le schéma du circuit de sécurité. Si plusieurs moteurs sont connectés à un entraînement, des contacteurs doivent être conçus pour les moteurs individuels conformément à la catégorie d'utilisation AC-3.

Sélectionner du contacteur du moteur en fonction du courant de fonctionnement nominal du moteur à connecter.

⚠ MISE EN GARDE

Les entrées anti-rebond ne sont pas permises dans le schéma du circuit de sécurité. Une commutation entre l'entraînement et l'alimentation d'entrée doit avoir lieu dans un état sans tension.

⚠ MISE EN GARDE

Les entrées anti-rebond ne sont pas permises dans le schéma du circuit de sécurité. Risque d'incendie !

Utiliser uniquement des câbles, des interrupteurs de protection et des contacteurs indiquant le courant nominal permis.

⚠ MISE EN GARDE

Avant de connecter l'entraînement à l'alimentation secteur CA, s'assurer que les réglages de la classe de protection CEM sont correctement effectués selon les instructions de ce manuel.

- **Si l'entraînement doit être utilisé dans un réseau de distribution flottant, retirer les vis au niveau des VOM et CEM. Voir « Installation dans un réseau à une phase connectée à la terre (corner-grounded) »**
- **Débrancher le filtre CEM interne lors de l'installation de l'entraînement sur un réseau IT (système d'alimentation non mis à la terre ou système d'alimentation électrique mis à la terre haute résistance [plus de 30 ohms]) pour ne pas que le système soit connecté au potentiel de terre via les condensateurs du filtre CEM. Ceci peut être une cause de dangers ou endommager l'entraînement**
- **Débrancher le filtre CEM interne lors de l'installation de l'entraînement sur un système TN à une phase connectée à la terre pour ne pas endommager l'entraînement**

Note: Lorsque le filtre CEM interne est débranché, l'entraînement peut ne pas être conforme aux normes de compatibilité électromagnétique.

- **Ne pas tenter d'installer ou de retirer les vis des VOM et CEM lorsque l'alimentation est appliquée aux bornes d'entrée de l'entraînement**

Sécurité du moteur et de l'équipement

⚠ MISE EN GARDE

N'effectuer aucun test de résistance de tension ou au mégohmmètre sur toute partie de l'entraînement ou de ses composants. Un test inadéquat peut entraîner des dommages.

⚠ MISE EN GARDE

Avant tout test ou mesure du moteur ou du câble du moteur, débrancher le câble du moteur au niveau des bornes de sortie de l'entraînement (U, V, W) pour éviter d'endommager ce dernier lors des tests.

⚠ MISE EN GARDE

Ne toucher aucun composant sur les cartes de circuit. Les décharges d'électricité statique peuvent endommager les composants.

⚠ MISE EN GARDE

Avant de mettre le moteur en marche, vérifier qu'il est correctement monté et aligné avec l'équipement entraîné. S'assurer que le démarrage du moteur ne risque pas de provoquer des blessures ou d'endommager l'équipement connecté au moteur.

⚠ MISE EN GARDE

Régler la vitesse maximale du moteur (fréquence) dans l'entraînement conformément aux exigences du moteur et de l'équipement qui lui est connecté. Des réglages de fréquence maximum incorrects peuvent endommager le moteur ou l'équipement et causer des blessures.

⚠ MISE EN GARDE

Avant d'inverser le sens de rotation du moteur, veiller à ce que cela ne risque pas de provoquer des blessures ou des dommages matériels.

⚠ MISE EN GARDE

S'assurer qu'aucun condensateur de correction de puissance n'est connecté à la sortie de l'entraînement ou aux bornes du moteur pour éviter un mauvais fonctionnement de l'entraînement et des dommages potentiels.

⚠ MISE EN GARDE

S'assurer que les bornes de sortie de l'entraînement (U, V, W) ne sont pas connectées à l'alimentation secteur, ce qui pourrait causer de graves dommages à l'entraînement.

⚠ MISE EN GARDE

Lorsque les bornes de commande de deux ou plusieurs unités d'entraînement sont raccordées en parallèle, la tension auxiliaire de ces connexions de commande doit être fournie par une source unique, qui peut être soit l'une des unités, soit une alimentation externe.

⚠ MISE EN GARDE

L'entraînement démarre automatiquement après une interruption de la tension d'entrée si la commande de démarrage externe est active.

⚠ MISE EN GARDE

Ne pas commander le moteur avec le dispositif de déconnexion ; à la place, utiliser les touches de marche et d'arrêt du tableau de contrôle ou les commandes du tableau des E/S de l'entraînement. Le nombre de cycles de charge maximum permis des condensateurs CC (c'est-à-dire les mises sous tension par application de puissance) est de cinq en dix minutes.

⚠ MISE EN GARDE

Fonctionnement incorrect de l'entraînement :

- **Si l'entraînement n'est pas mis en marche pendant une longue période, la performance de ses condensateurs électrolytiques sera réduite**
- **S'il est arrêté pour une période prolongée, le mettre en marche au moins tous les six mois pendant au moins 5 heures pour restaurer la performance des condensateurs, puis vérifier son fonctionnement. Il est recommandé de ne pas brancher l'entraînement directement sur la tension secteur. La tension doit être augmentée progressivement en utilisant une source CA réglable**

Le non-respect de ces instructions peut entraîner des blessures ou des dégâts matériels.

PowerXL DX1 drive overview

This chapter describes the purpose and contents of this manual, the receiving inspection recommendations and the PowerXL DX1 Series variable frequency drive (VFD) catalog numbering system.

How to use this manual

The purpose of this manual is to provide you with information necessary to install, set and customize parameters, start up, troubleshoot and maintain the PowerXL DX1 Series Variable Frequency Drive (VFD). To provide for safe installation and operation of the equipment, read the safety guidelines at the beginning of this manual and follow the procedures outlined in the following chapters before connecting power to the PowerXL DX1 Series VFD. Keep this operating manual handy and distribute to all users, technicians and maintenance personnel for reference.

Table 1. Common abbreviations

Abbreviation	Definition
CT	Constant torque with high overload rating (150%)
VT	Variable torque with low overload rating (110%)
I_H	High overload current (150%)
I_L	Low overload current (110%)
VFD	Variable Frequency Drive
RTC	Real Time Clock

Receiving and inspection

The PowerXL DX1 Series VFD has met a stringent series of factory quality requirements before shipment. It is possible that packaging or equipment damage may have occurred during shipment. After receiving your PowerXL DX1 Series VFD, please check for the following:

Check to make sure that the package includes the Instruction Leaflet, Quick Start Guide and accessory packet. The accessory packet includes:

- Rubber grommets
- Control cable grounding clamps
- Additional grounding screw

Inspect the unit to ensure it was not damaged during shipment.

Make sure that the part number indicated on the nameplate corresponds with the catalog number on your order.

If shipping damage has occurred, please contact and file a claim with the carrier involved immediately.

If the delivery does not correspond to your order, please contact your representative.

Real-time clock battery activation

To activate the real-time clock (RTC) functionality in the PowerXL DX1 Series VFD, the RTC battery (already mounted in the drive) must be enabled.

Figure 1. Battery connect

Step 1: Disassembly A cover.

Step 2: Open B cover.

Step 3: Remove the insulation.

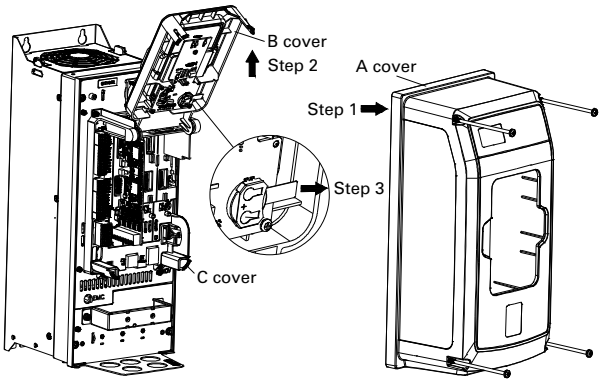


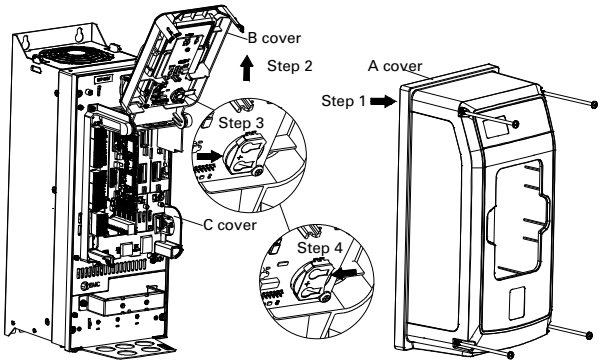
Figure 2. RTC battery replacement

Step 1: Disassembly A cover.

Step 2: Open B cover.

Step 3: Remove old battery.

Step 4: Install new battery.



Notes: Users need to select coin batteries that meet operating temperature requirement (cover the range –20 °C to +80 °C) for replacement. The recommended battery types are:
CR2032W (Murata)
CR2032X (Murata)
CR2032 (Industrial Panasonic)

Rating label

Figure 3. Rating label (PowerXL DX1)

DX1 230V rating label

DX1 480V rating label

DX1 575V rating label

DX1 carton 230V rating label

DX1 carton 480V rating label

DX1 carton 575V rating label

General information

The PowerXL DX1 drive provides a wide selection of option boards to increase the number and type of control inputs and outputs (I/O) and communication interfaces to provide the versatility required for today's demanding motor control applications.

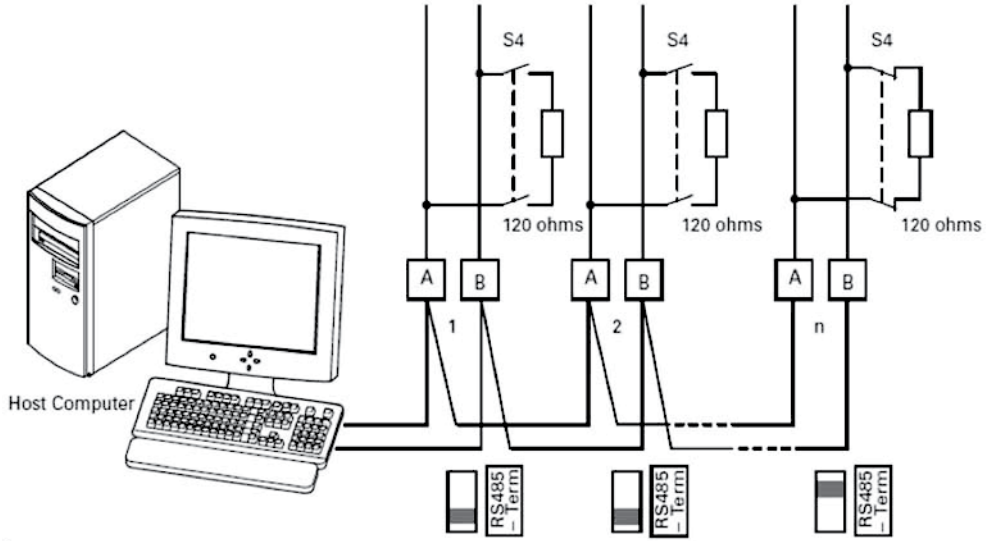
The input and output capability is designed with modularity in mind, comprised of option boards, each having its own input and output configuration. The control unit is designed to accept a total of four boards, the boards provide standard analog and digital inputs and outputs, fieldbus capability, and application specific hardware.

The basic, expander and adapter boards are installed in board slots, which are parts of the control board. Please refer to PowerXL DX1 option cards manual and comm cards manual.

Modbus RTU on-board communications

The PowerXL DX1 drive product can be controlled via Modbus® RTU through the on-board RS-485 terminals.

Figure 4. Connection diagram



The figure shows a typical arrangement with a host computer (master) and any number maximum 31 slaves of frequency inverters. Each frequency inverter has a unique address in the network. This addressing is executed individually for each VFD via the communication parameters.

The electrical connection between master and the slaves connected in paralwwlel are implemented via the serial interface A-B (A = positive, B = negative) with a shielded RS-485 twisted pair cable.

Modbus RTU specifications

Communication board connections

Table 2. Connections

Item	Description
Interface	
Data Transfer Method	RS-485, half-duplex
Transfer Cable	Twisted pair (1 pair and shield)
Electrical Isolation	

Communications

Table 3. Communications

Item	Description
Modbus RTU	As described in "Modicon Modbus Protocol Reference Guide" found at. http.//public.modicon.com/
Baud Rate	9600,19200,38400,57600,115200
Addresses	1 to 247

Connections

The RS-485 communication port is connected via the 485_A and 485_B terminals on the drives control board.

Figure 5. Terminal wiring

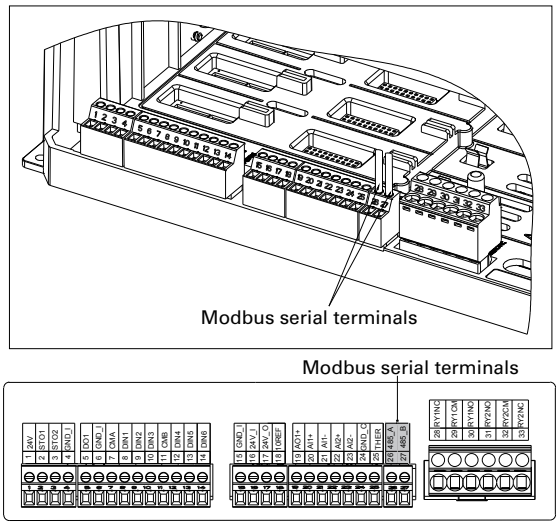
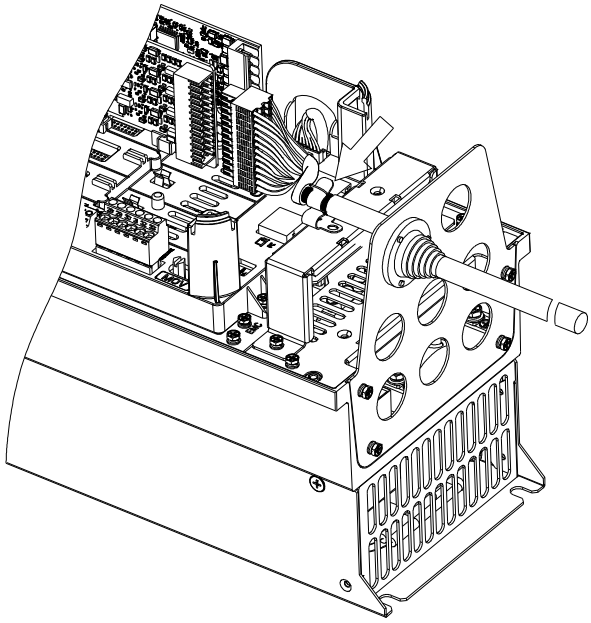


Figure 6. Termination resistor and shielding



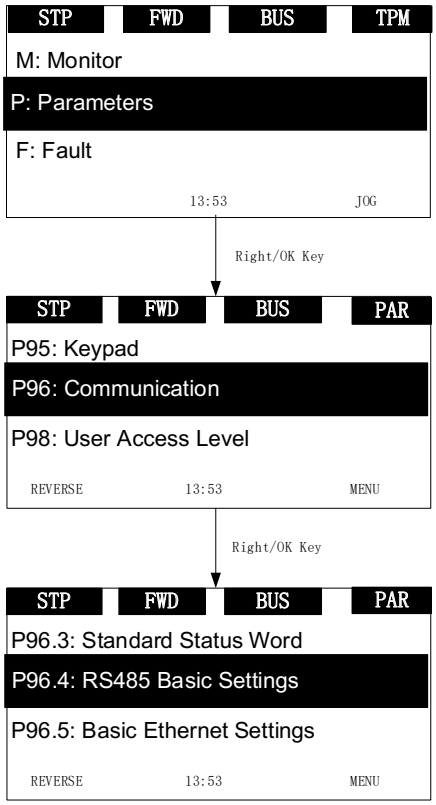
Commissioning

RS-485 communication parameters

To commission the RS-485 communication board, enter the Keypad menu as described below.

Change the Modbus RTU commissioning parameter values.

Figure 7. PowerXL DX1 keypad navigation to RS-485 menu



In this menu you will be able to scroll through the below settings to setup the communication protocol.

Table 4. Modbus RTU

DX1 code	Parameter	Min.	Max.	Unit	Default	ID	Note
P96.4.1	RS485 comm set				0	586	0 = Modbus RTU
P96.9.4	Slave address	1	247		1	587	
P96.9.1	Baud rate				1	584	0 = 9600 1 = 19200 2 = 38400 3 = 57600 4 = 115200"
P96.9.2	Parity type				2	585	0 = None, 2 Stop Bits 1 = Odd, 1 Stop Bit 2 = Even, 1 Stop Bit 3 = None, 1 Stop Bit"
P96.4.2	Protocol status				0	588	0 = Initial 2 = Operational 3 = Faulted"
—	Slave busy				0	589	0 = Not Busy 1 = Busy"
—	Parity error				0	590	
—	Slave fault				0	591	
—	Last fault response				0	592	
P96.9.3	COMM TIMEOUT MODBUS RTU			ms	10000	593	
P96.9.5	Modbus RTU fault response	0	1		0	2516	0 = In Fieldbus Control 1 = in all Control"

The parameters of every device must be set before connecting to the bus. Each parameter must be the same as the master configuration.

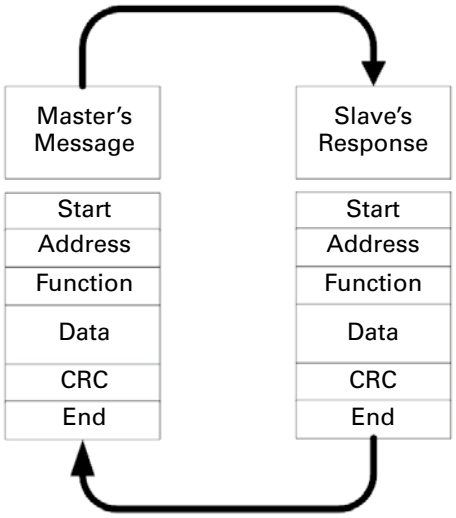
Modbus communication standards

The Modbus protocol is an industrial communications and distributed control system to integrate PLCs, computers, terminals, and other monitoring, sensing and control devices. Modbus is a Master-Slave communications protocol. The Master controls all serial activity by selectively polling one or more slave devices. The protocol provides for one master device and up to 247 slave devices on a common line. Each device is assigned an address to distinguish it from all other connected devices.

The Modbus protocol uses the master-slave technique, in which only one device (the master) can initiate a transaction. The other devices (the slaves) respond by supplying the requested data to the master, or by taking the action requested in the query. The master can address individual slaves or initiate a broadcast message to all slaves. Slaves return a message ("response") to queries that are addressed to them individually. Responses are not returned to broadcast queries from the master.

A transaction comprises a single query and single response frame or a single broadcast frame. The transaction frames are defined below.

Figure 8. The basic structure of a modbus frame



Valid slave device addresses are in the range of 0–247 decimal. The individual slave devices are assigned addresses in the range of 1–247. A master addresses a slave by placing the slave address in the address field of the message. When the slave sends its response, it places its own address in this address field of the response to let the master know which slave is responding.

The function code field of a message frame contains two characters (ASCII) or eight bits (RTU). Valid codes are in the range of 1–255 decimal. When a message is sent from a master to a slave device, the function code field tells the slave what kind of action to perform.

Examples are to read the ON/OFF states of a group of discrete coils or inputs; to read the data contents of a group of registers; to read the diagnostic status of the slave; to write to designated coils or registers; or to allow loading, recording or verifying the program within the slave.

When the slave responds to the master, it uses the function code field to indicate either a normal (error-free) response or that some kind of error occurred (called an exception response). For a normal response, the slave simply echoes the original function code. For an exception response, the slave returns a code that is equivalent to the original function code with its most significant bit set to a logic state of 1.

The data field is constructed using sets of two hexadecimal digits, in the range of 00 to FF hexadecimal. These can be made from a pair of ASCII characters, or from one RTU character, according to the network's serial transmission mode.

The data field of messages sent from a master to slave devices contains additional information that the slave must use to take the action defined by the function code. This can include items like discrete and register addresses, the quantity of items to be handled, and the count of actual data bytes in the field.

If no error occurs, the data field of a response from a slave to a master contains the data requested. If an error occurs, the field contains an exception code that the master application can use to determine the next action to be taken.

Two kinds of checksum are used for standard Modbus networks. The error checking field contents depend upon the transmission method that is being used.

Supported functions

Table 5. Functions

Function code	Description
0x01	Read coils
0x02	Read discrete inputs
0x03	Read holding registers
0x04	Read input registers
0x05	Write single coil
0x06	Write single register
0x07	Read exception status
0x08	Read diagnostics (Only support 0x00 return query data)
0x0F	Write multiple coils
0x10	Write multiple registers
0x17	Read/write multiple registers
0x2B/0x0E	Read device identity

Note: Broadcasting can be used with codes 0x05, 0x06, 0x0F and 0x10.

Example of the request to read coils 2000–2003 from Slave device 18.

Table 6. Request to read coils

Item	Code	Description
Slave address	0x12	
Function code	0x01	
Start address High	0x07	Starting address 0x07D0 hex (= 2000)
Start address Low	0xD0	
Number of coils High	0x00	Number of coils 0x0003 hex (= 3)
Number of coils Low	0x03	
CRC High	0x7E	
CRC Low	0x25	

Example of the request to read Discrete Inputs 2000–2003 from Slave device 18.

Table 7. Request to read discrete inputs

Item	Code	Description
Slave address	0x12	
Function code	0x02	
Start address High	0x07	Starting address 0x07D0 hex (= 2000)
Start address Low	0xD0	
Number of Discrete Inputs High	0x00	Number of Discrete Inputs 0x0003 hex (= 3)
Number of Discrete Inputs Low	0x03	
CRC High	0x3A	
CRC Low	0x25	

Example of the request to read Holding Registers 2000–2003 from Slave device 18.

Table 8. Request to read holding registers

Item	Code	Description
Slave address	0x12	
Function code	0x03	
Start address High	0x07	Starting address 0x07D0 hex (= 2000)
Start address Low	0xD0	
Number of Holding Registers High	0x00	Number of Holding Registers 0x0003 hex (= 3)
Number of Holding Registers Low	0x03	
CRC High	0x07	
CRC Low	0xE5	

Example of the request to read Input Registers 2000–2003 from Slave device 18.

Table 9. Request to read input registers

Item	Code	Description
Slave address	0x12	
Function code	0x04	
Start address High	0x07	Starting address 0x07D0 hex (= 2000)
Start address Low	0xD0	
Number of Input Registers High	0x00	Number of Input Registers 0x0003 hex (= 3)
Number of Input Registers Low	0x03	
CRC High	0xB2	
CRC Low	0x25	

Example of the request to read exception status from Slave device 18.

Table 10. Request to read exception status

Item	Code	Description
Slave address	0x12	
Function code	0x07	
CRC High	4C	
CRC Low	D2	

Example of Read Diagnostics from Slave address 18.

Table 11. Read diagnostics

Item	Code	Description
Slave address	0x12	
Function code	0x08	
Sub function High	0x00	Sub function code 0x0000 (= 0)
Sub function Low	0x00	Note. Only support sub function code 0x0000
Data High	0xA5	Data 0xA5A5 (= 42405)
Data Low	0xA5	
CRC High	0x59	
CRC Low	0x83	

Example of the request to write single coil 2000 from slave device 18, the output value is 65280.

Table 12. Request to write single coil

Item	Code	Description
Slave address	0x12	
Function code	0x05	
Output address High	0x07	Starting address 0x07D0 hex (= 2000)
Output address Low	0xD0	
Output value High	0xFF	Output value 0xFF00 hex (= 65280)
Output value Low	0x00	Note. Output value is 0x0000 or 0xFF00
CRC High	0x8E	
CRC Low	0x14	

Example of the request to write single register 2000 from Slave device 18, the output value is 5.

Table 13. Request to write single register

Item	Code	Description
Slave address	0x12	
Function code	0x06	
Output address High	0x07	Starting address 0x07D0 hex (= 2000)
Output address Low	0xD0	
Output value High	0x00	Output value 0x0005 hex (= 5)
Output value Low	0x05	
CRC High	0x4B	
CRC Low	0xE7	

Example of Write coils 19–28 from Slave device 18.

Table 14. Write coils 19–28

Item	Code	Description
Slave Address	0x12	
Function code	0x0F	
Starting Address High	0x00	Starting Address 0x0013 (= 19)
Starting Address Low	0x13	
Quantity of Outputs High	0x00	Quantity of Outputs 0x000A (= 10)
Quantity of Outputs Low	0x0A	
Bye Count	0x02	
Outputs Value High	0xCD	
Outputs Value Low	0x01	
CRC High	0xAB	
CRC Low	0xFB	

Note: The binary outputs in the previous example correspond to the outputs in the following way.

Binary bits and corresponding outputs

Bit	1	1	0	0	1	1	0	1	0	0	0	0	0	0	1
Output	26	25	24	23	22	21	20	19	—	—	—	—	—	28	27

Example of write Holding registers 2000-2001 from Slave device 18.

Table 15. Request to write holding registers

Item	Code	Description
Slave Address	0x12	
Function code	0x10	
Starting Address High	0x07	Starting Address 0x07D0 (= 2000)
Starting Address Low	0xD0	
Quantity of Outputs High	0x00	Quantity of Outputs 0x0002 (= 2)
Quantity of Outputs Low	0x02	
Bye Count	0x04	
Outputs Value High	0x00	
Outputs Value Low	0x01	
Outputs Value High	0x00	
Outputs Value Low	0x02	
CRC High	0x53	
CRC Low	0x46	

Modbus registers

The variables and fault codes as well as the parameters can be read and written from Modbus. The parameter addresses are determined in the application. Every parameter and actual value have been given an ID number in the application. The ID numbering of the parameter as well as the parameter ranges and steps can be found in the application manual in question. The parameter value shall be given without decimals.

All values can be read with function codes 3 and 4 (all registers are 3X and 4X reference). Modbus registers are mapped to drive IDs as follows.

Table 16. Index table

ID	Modbus register	Group	R/W
1-98	40001-40098 30001-30098	Actual Values	1/1
100	40099(30099)	Fault Code	1/1
101-1999	40101-41999 30101-31999	Parameters	1/1
2004–2018	42004–42018 (32004–32018)	Process Data In	1/1
2104–2111	42104–42111 (32104–32111)	Process Data Out	1/1
3992-3998	43992-43998 (33992-33998)	Process Data Out	

Process data

The process data fields are used to control the drive (e.g., Run, Stop, Reference, Fault Reset) and to quickly read actual values (e.g., Output frequency, Output current, Fault code). The fields are structured as follows.

Table 17. Process data slave ⟶ master (max. 22 bytes)

ID	Modbus register	Group	Range/Type
2101	32101, 42101	FB Status Word	Binary coded
2102	32102, 42102	FB General Status Word	Binary coded
2103	32103, 42103	FB Actual Speed	0–100.00%
2104	32104, 42104	FB Process Data Out 1	Integer 16
2105	32105, 42105	FB Process Data Out 2	Integer 16
2106	32106, 42106	FB Process Data Out 3	Integer 16
2107	32107, 42107	FB Process Data Out 4	Integer 16
2108	32108, 42108	FB Process Data Out 5	Integer 16
2109	32109, 42109	FB Process Data Out 6	Integer 16
2110	32110, 42110	FB Process Data Out 7	Integer 16
2111	32111, 42111	FB Process Data Out 8	Integer 16
3992	33992,43992	FB Process Data Out 9	Integer 32
3994	33994,43994	FB Process Data Out 10	Integer 32
3996	33996,43996	FB Process Data Out 11	Integer 32
3998	33998,43998	FB Process Data Out 12	Integer 32

Table 18. Process data master ⟶ slave (max. 38 bytes)

ID	Modbus register	Group	Range/Type
2001	32001, 42001	FB Control Word	Binary coded
2002	32002, 42002	FB General Control Word	Binary coded
2003	32003, 42003	FB Speed Reference	0–100.00% Hz
2004	32004, 42004	FB Process Data In 1	Integer 16
2005	32005, 42005	FB Process Data In 2	Integer 16
2006	32006, 42006	FB Process Data In 3	Integer 16
2007	32007, 42007	FB Process Data In 4	Integer 16
2008	32008, 42008	FB Process Data In 5	Integer 16
2009	32009, 42009	FB Process Data In 6	Integer 16
2010	32010, 42010	FB Process Data In 7	Integer 16
2011	32011, 42011	FB Process Data In 8	Integer 16
2012	32012,42012	FB Process Data In 9	Integer 32
2014	32014,42014	FB Process Data In 10	Integer 32
2016	32016,42016	FB Process Data In 11	Integer 32
2018	32018,42018	FB Process Data In 12	Integer 32

The use of process data depends on the application. In a typical situation, the device is started and stopped with the Control Word (CW) written by the Master and the Rotating speed is set with Reference (REF). With PD1–PD8 the device can be given other reference values (e.g., Torque reference). With the Status Word (SW) read by the Master, the status of the device can be seen. Actual Value (ACT) and PD1–PD8 show the other actual values.

Process data in

This register range is reserved for the control of the VFD. Process Data In is located in range ID 2001–2099. The registers are updated every 10 ms. See table below.

Table 19. Fieldbus basic input table

ID	Modbus register	Group	Range/Type
2001	32001, 42001	FB Control Word	Binary coded
2002	32002, 42002	FB General Control Word	Binary coded
2003	32003, 42003	FB Speed Reference	0–100.00%
2004	32004, 42004	FB Process Data In 1	Integer 16
2005	32005, 42005	FB Process Data In 2	Integer 16
2006	32006, 42006	FB Process Data In 3	Integer 16
2007	32007, 42007	FB Process Data In 4	Integer 16
2008	32008, 42008	FB Process Data In 5	Integer 16
2009	32009, 42009	FB Process Data In 6	Integer 16
2010	32010, 42010	FB Process Data In 7	Integer 16
2011	32011, 42011	FB Process Data In 8	Integer 16
2012	33992,43992	FB Process Data In 9	Integer 32
2014	33994,43994	FB Process Data In 10	Integer 32
2016	33996,43996	FB Process Data In 11	Integer 32
2018	33998,43998	FB Process Data In 12	Integer 32

Note: For FB Process Data In, see section below on Process Data IN.

Control word

The drive uses 16 bits as shown below. These bits are application specific.

Binary bits and corresponding outputs

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
[a]	[a]	INCH ON/ OFF	JOG ON/ OFF	HOA Bit 2	HOA Bit 1	FB Ref	FB Ctrl	Bypass	FB DI 4	FB DI 3	FB DI 2	FB DI 1	Fault Reset	Reverse	RUN

Note:
[a] The bit is not used.

Table 20. FB control word

Bit	Description Value = 0	Value = 1
0	Drive Output Off	Drive Output On
1	Clockwise Rotation	Counter Clockwise
2	No Reset	Fault Reset
3	FB INDATA1 Off	FB INDATA1 On
4	FB INDATA2 Off	FB INDATA2 On
5	FB INDATA3 Off	FB INDATA3 On
6	FB INDATA4 Off	FB INDATA4 On
7	Bypass Relay Disable	Bypass Relay Enable
8	FB Control Off	FB Control On
9	FB Reference Off	FB Reference On
10	HOA1 On (not in use)	HOA1 Off (not in use)
11	HOA2 On (not in use)	HOA2 off (not in use)
12	JOG ON/OFF	Jog On/Off
13	INCH ON/OFF	Inch On/Off
14–15	Not in use	Not in use

Process data in 1 to 12
Process Data In values 1 to 12 can be used in applications for various purposes. See Process Data IN section for setup.

FB general control word

The PowerXL series drive does not use the FB General Control Word. The main control word is used to provide commands to the drive.

Speed reference

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	LSB

This is the Reference 1 to the VFD. Used normally as Speed reference.

The scaling on this value is 0–100.00% of the Maximum Frequency. The 0 to 100.00% is represented by 0 to 10,000 value indicating 0 or 0% as Minimum Frequency and 10,000 or %100.00 as Maximum Frequency. This value has 2 decimal places in it.

Process data in 1 to 8

Process Data In values 1 to 8 can be used in applications for various purposes. See Process Data IN section for setup.

Process data out

This register range is normally used to fast monitoring of the VFD. Process Data Out is located in range ID 2101–2199. See table below.

Table 21. Fieldbus basic output table

ID	Modbus Register	Group	Range/Type
2101	32101, 42101	FB Status Word	Binary coded
2102	32102, 42102	FB General Status Word	Binary coded
2103	32103, 42103	FB Actual Speed	%
2104	32104, 42104	FB Process Data Out 1	Integer 16
2105	32105, 42105	FB Process Data Out 2	Integer 16
2106	32106, 42106	FB Process Data Out 3	Integer 16
2107	32107, 42107	FB Process Data Out 4	Integer 16
2108	32108, 42108	FB Process Data Out 5	Integer 16
2109	32109, 42109	FB Process Data Out 6	Integer 16
2110	32110, 42110	FB Process Data Out 7	Integer 16
2111	32111, 42111	FB Process Data Out 8	Integer 16
3992	33992,43992	FB Process Data Out 9	Integer 32
3994	33994,43994	FB Process Data Out 10	Integer 32
3996	33996,43996	FB Process Data Out 11	Integer 32
3998	33998,43998	FB Process Data Out 12	Integer 32

FB status word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
—	—	—	—	Inch ON/OFF	Jog ON/OFF	HOA Status BIT 2	HOA Status BIT 1	Run_enable	Bypass	AT_reference	Warning	Fault	Direction	Running	Ready

Information about the status of the device and messages is indicated in the FB Status Word. The FB Status Word is composed of 16 bits that have the following meanings.

Table 22. FB status word bit descriptions

Bit	Description Value = 0	Value = 1
0	Not Ready	Ready
1	STOP	RUN
2	Clockwise	Counterclockwise
3	—	Faulted
4	—	Warning
5	Ref. frequency not reached	Ref. frequency reached
6	Bypass not activated	Bypass activated
7	Run disable	Run Enable
8	HOA1 Off (not in use)	HOA1 On (not in use)
9	HOA2 Off (not in use)	HOA2 On (not in use)
10	Jog off	Jog On
11	Inch Off	Inch On
12-15	Not in use	Not in use

Process data out 1 to 12
Process Data Out values 1 to 12 can be used in application for various purposes. See below tables for additional information.

Table 23. FB general status word

Bit	Description Value = 0	Value = 1
0	Not Ready	Ready
1	Stop	Run
2	Clockwise	Counter Clockwise
3	No Fault	Fault
4	No Warning	Warning
5	Ref. Frequency Not Reached	Ref. Frequency Reached
6	Ref > 0 Speed	Ref = 0 speed
7	Jog Off	Jog On a
8	Fire mode not active	Fire mode active
9	Fire mode test not active	Fire mode test active
10	IO Input not active	IO Input Active
11	DC Brake Off	DC Brake On
12	FB Ref Not Enable	FB Ref Enabled
13	FB Control Word Not Active	FB Control Word Active
14	Remote Not Enable	Remote Enable
15	OFF not active (Local/Remote is active)	OFF Active (Local & Remote is not active)

Note:
[a] The bit is not used.

Speed reference

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	LSB

This is the Actual Speed of the motor. This value comes back in the form of %.

Process data out 1 to 12

Process Data Out values 1 to 12 can be used in application for various purposes. See below tables for additional information.

Process data OUT (slave ⟶ master)

The fieldbus master can read the VFD actual values using process data variables. The applications use process data as follows. These values are selectable via the Fieldbus Process Data parameter group. These values would correspond to the Modbus ID value. See **Appendix A** for Parameter ID table showing values can be set.

Table 24. Process data OUT

Id	Data	Value	Default value	Default para	Unit	Scale
2104	Process Data OUT 1	-32768–32767	1	Output Frequency	Hz	
2105	Process Data OUT 2	-32768–32767	8	Unit Temperature	Deg. C	
2106	Process Data OUT 3	-32768–32767	3	Motor Current	A	
2107	Process Data OUT 4	-32768–32767	4	Motor Torque	%	
2108	Process Data OUT 5	-32768–32767	5	Motor Power	%	
2109	Process Data OUT 6	-32768–32767	6	Motor Voltage	V	
2110	Process Data OUT 7	-32768–32767	7	DC Link Voltage	V	
2111	Process Data OUT 8	-32768–32767	28	Latest Fault Code	—	
3992	Process Data OUT 9	-2147483648-2147483647	—	—	—	
3994	Process Data OUT 10	-2147483648-2147483647	—	—	—	
3996	Process Data OUT 11	-2147483648-2147483647	—	—	—	
3998	Process Data OUT 12	-2147483648-2147483647	—	—	—	

Process data IN (master ⟶ slave)

Control Word, Reference and Process Data are used with All-in-One applications as follows.

Table 25. Process data IN

ID	Data	Value	Unit	Scale
2003	Reference	Speed Reference	%	0.01
2001	Control Word	—	—	—
2004	Process Data IN1	—	—	—
2005	Process Data IN2	—	—	—
2006	Process Data IN3	—	—	—
2007	Process Data IN4	—	—	—
2008	Process Data IN5	—	—	—

ID	Data	Value	Unit	Scale
2009	Process Data IN6	—	—	—
2010	Process Data IN7	—	—	—
2011	Process Data IN8	—	—	—
2012	Process Data In 9	—	—	—
2014	Process Data In 10	—	—	—
2016	Process Data In 11	—	—	—
2018	Process Data In 12	—	—	—

Note:

[a] Process Data IN1 through Process Data IN8 change based off the selected application. See **Appendix B** for layout.

Startup test

Select Fieldbus (Bus/Comm) as the active control and reference place.

1. Set FB control word (Modbus Address 42001) value to 301hex.
2. The drive status is RUN.
3. Set FB Speed reference (Modbus Address 42003) value to 5000 (= 50.00%).
4. The Actual value is 5000 and the output frequency is 50.00%.
5. Set FB control word (Modbus Address 42001) value to 300hex.
6. The drive status is STOP.

Modbus TCP on-board communications

Modbus/TCP specifications

Table 26. Modbus/TCP technical data

General	Description	Specification
Ethernet connections	Interface	RJ-45 connector
Communications	Transfer cable	Shielded twisted pair
	Speed	10/100 Mb
	Duplex	Half/full
	Default IP–address Mode	Static
Default static IP configurations	Default static IP address	192.168.1.254
	Default Network Mask	255.255.255.0
	Default Gateway Address	192.168.1.1

Modbus/TCP protocol

Modbus/TCP is a variant of the Modbus family. It is a manufacturer-independent protocol for monitoring and controlling automatic devices. Modbus/TCP is a client-server protocol. The client makes queries to the server by sending "request" messages to the server's TCP port 502. The server answers client queries with "response" messages. The term "client" can refer to a master device that runs queries. Correspondingly, the term "server" refers to a slave device that serves the master device by answering its queries. Both the request and the response messages are composed as follows.

Byte 0. Transaction ID High

Byte 1. Transaction ID Low

Byte 2. Protocol ID High

Byte 3. Protocol ID Low

Byte 4. Length field High

Byte 5. Length field Low

Byte 6. Unit identifier

Byte 7. Modbus function code

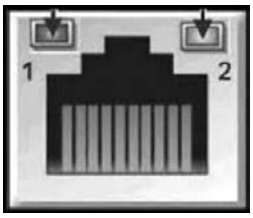
Byte 8. Data (of variable length)

Modbus/TCP vs. Modbus RTU

Compared to the Modbus RTU protocol, the Modbus/TCP differs mostly in error checking and slave addresses. As the TCP already includes an efficient error checking function, the Modbus/TCP protocol does not include a separate CRC field. In addition to the error checking functionality, the TCP is responsible for resending packets and for splitting long messages so that they fit the TCP frames. The slave address field of the Modbus/RTU is named as the unit identifier field in Modbus/TCP, and it is only used when one IP address stands for several endpoints.

Hardware specifications

Ethernet port LED indications



Ethernet LED

1. Ethernet Link Status
2. Ethernet Link Speed

Table 27. Ethernet LED description

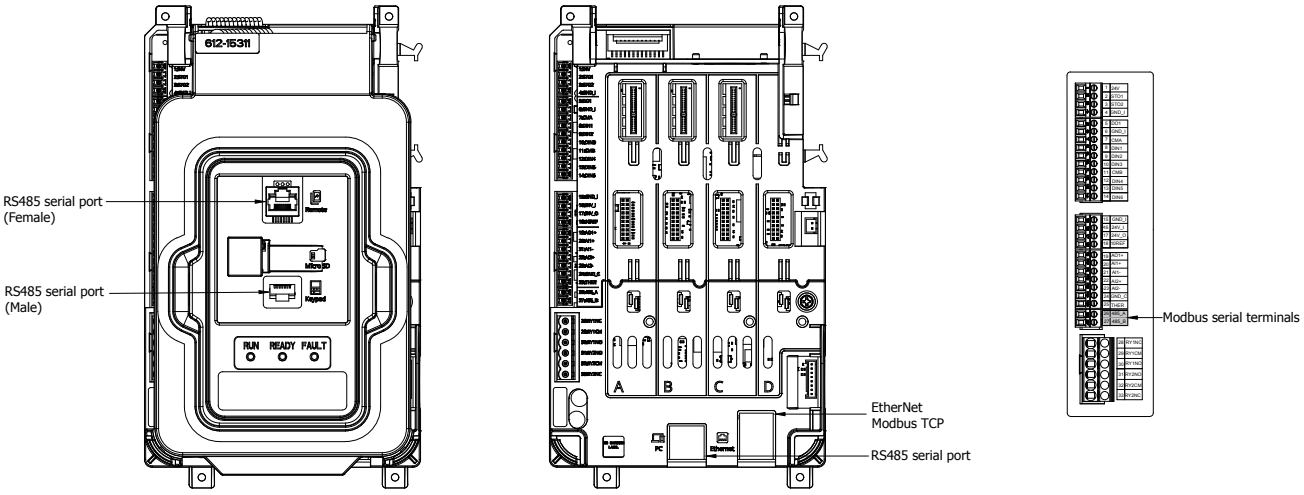
LED	Meaning
Ethernet link status	Flashes with Ethernet message activity.
Ethernet link speed	Displays the link speed.
	Yellow LED on the Ethernet Jack is ON when link speed is 100 mbps
	Yellow LED on the Ethernet Jack is OFF when link speed is 10 mbps

Ethernet LED indications at power up

When the drive is powered up, an indicator test will be performed. To allow a visual inspection, the following sequence will be performed.

1. Turn first indicator Green, all other indicators off.
2. Leave first indicator on Green for approximately 0.25 second.
3. Turn first indicator on Red for approximately 0.25 second.
4. Turn first indicator on Green.
5. Turn second indicator (if present) on Green for approximately 0.25 second.
6. Turn second indicator (if present) on Red for approximately 0.25 second.
7. Turn second indicator (if present) Off.

If other indicators are present, test each indicator in sequence as prescribed by the second indicator above. If a Module Status indicator is present, it will be the first indicator in the sequence, followed by any Network Status indicators present. After completion of this power up test, the indicator(s) will turn to a normal operational state.



Commissioning

Connections and wiring

The Ethernet port supports 10/100 Mb speeds in both full and half-duplex modes. The boards must be connected to the Ethernet network with a shielded CAT-5e cable. A crossover cable (at least CAT-5e cable with STP, shielded twisted pair) may be needed if you want to connect the EtherNet/IP board directly to the master appliance.

Use only industrial standard components in the network and avoid complex structures to minimize the length of response time and the amount of incorrect dispatches. It is often a good practice to use a subnet that is different from other devices not related to the drive control.

Figure 9. CAT-5e cable

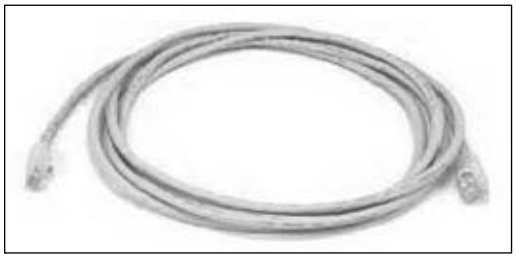


Figure 10. PowerXL DX1 keypad navigation to enable Modbus TCP

In this menu you will be able to scroll through the below settings to setup the communication protocol.

Table 28. Modbus TCP

DX1 code	Parameter	Min.	Max.	Unit	Default	ID	Note
P96.5.1	IP Address Mode				0	1500	0 = Static IP 1 = DHCP with AutoIP
P96.5.2	Active IP Address					1507	
P96.5.3	Active Subnet Mask					1509	
P96.5.4	Active Default Gateway					1511	
P96.5.5	MAC Address					1513	
P96.5.6	Static IP Address				192.168.1.254	1501	
P96.5.7	Static Subnet Mask				255.255.255.0	1503	
P96.5.8	Static Default Gateway				192.168.1.1	1505	
P96.13.1	Connection Limit	0	5		5	609	
P96.13.2	Modbus TCP Unit ID				1	610	
P96.13.3	Comm Timeout Modbus TCP			ms	10000	611	
P96.13.4	Protocol Status				0	612	0 = Stopped 1 = Operational 2 = Faulted 0 = Not Busy 1 = Busy
	Slave Busy				0	613	
	Parity Error				0	614	
	Slave Failure				0	615	
	Last Fault Response				0	616	
P96.13.5	Modbus TCP Fault Response	0	1		0	2517	0 = In Fieldbus Control 1 = In all Control
P96.6.4	Trusted IP Enable				1	74	0 = Disabled 1 = Enabled
P96.6.2	Trusted IP Whitelist				0.0.0.0,	68	
					0.0.0.0,		
					192.168.1.254		
P96.6.5	Modbus TCP Enable				0	1942	0 = Disabled 1 = Enabled

DHCP

The Ethernet communication supports DHCP for easier network configuration. Dynamic Host Configuration Protocol (DHCP) is a network protocol that is used to configure network devices so that they can communicate on an IP network. As a DHCP client, the Ethernet negotiates with the DHCP server to determine its IP address and obtain any other initial configuration details it needs for network operation.

IP address

IP is divided into four parts. (Part = Octet) Default Static IP Address is 192.168.1.254.

Communication timeout

Defines how much time can pass from the last received message from the client device before fieldbus fault is generated. Default communication timeout is 10 seconds.

Note: If the network cable is broken from the Ethernet port, a fieldbus error is generated immediately.

Static IP address

In most cases the user may want to establish a Static IP Address for the Ethernet based on their network configuration.

Static IP address default configurations are as defined in "EtherNet/IP network settings" table, provided in "Connections and Wiring" section.

The user can manually define the network address for the Ethernet as long as all units connected to the network are given the same network portion of the address. In these situations, the user will need to manually set the IP Address in the device by using the drive keypad. Be aware that overlapping IP addresses can cause conflicts between devices on the network. For more information about selecting IP addresses, contact your network administrator.

Unit identifier

The Unit Identifier used in Modbus TCP is used for the Modbus protocol in place of the slave address used in Modbus RTU. This Unit Identifier is used to communicate via devices such as bridges, routers and gateways that use a single IP address to support multiple independent Modbus end units.

Manual IP address configuration

Using the PowerXL drive keypad

Using the Drive Keypad to set the IP Address manually in the device.

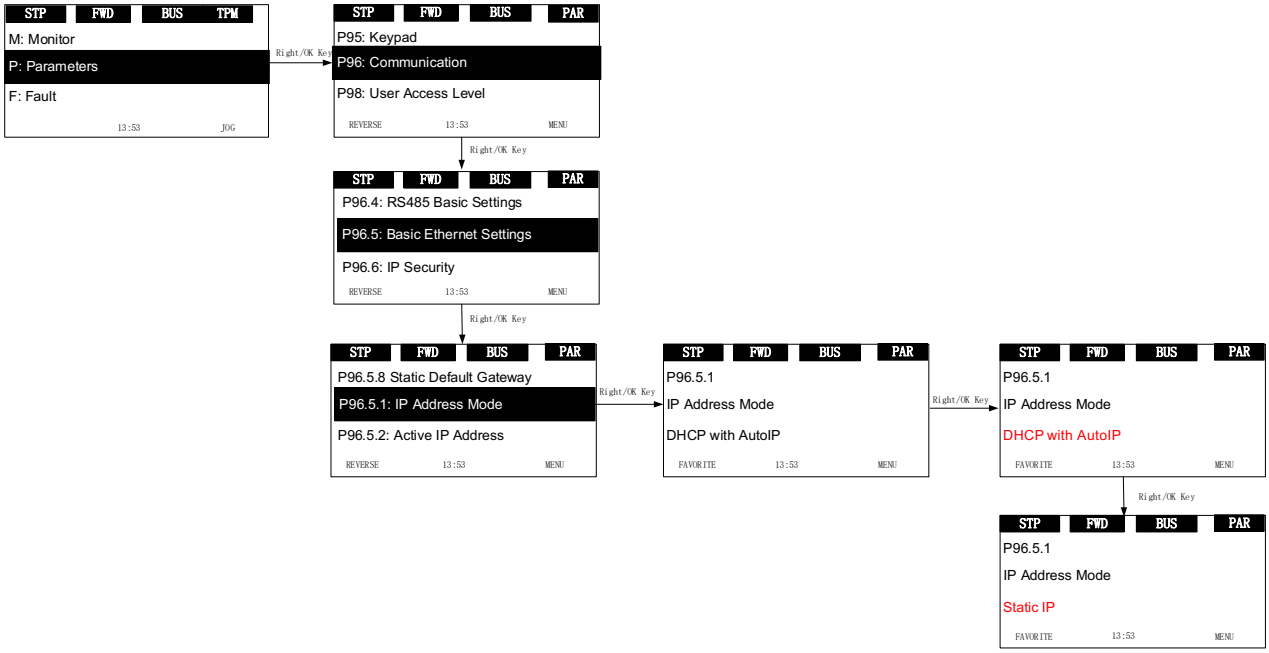
1. Select IP addressing mode as Static IP. Static IP mode configurations will be loaded.

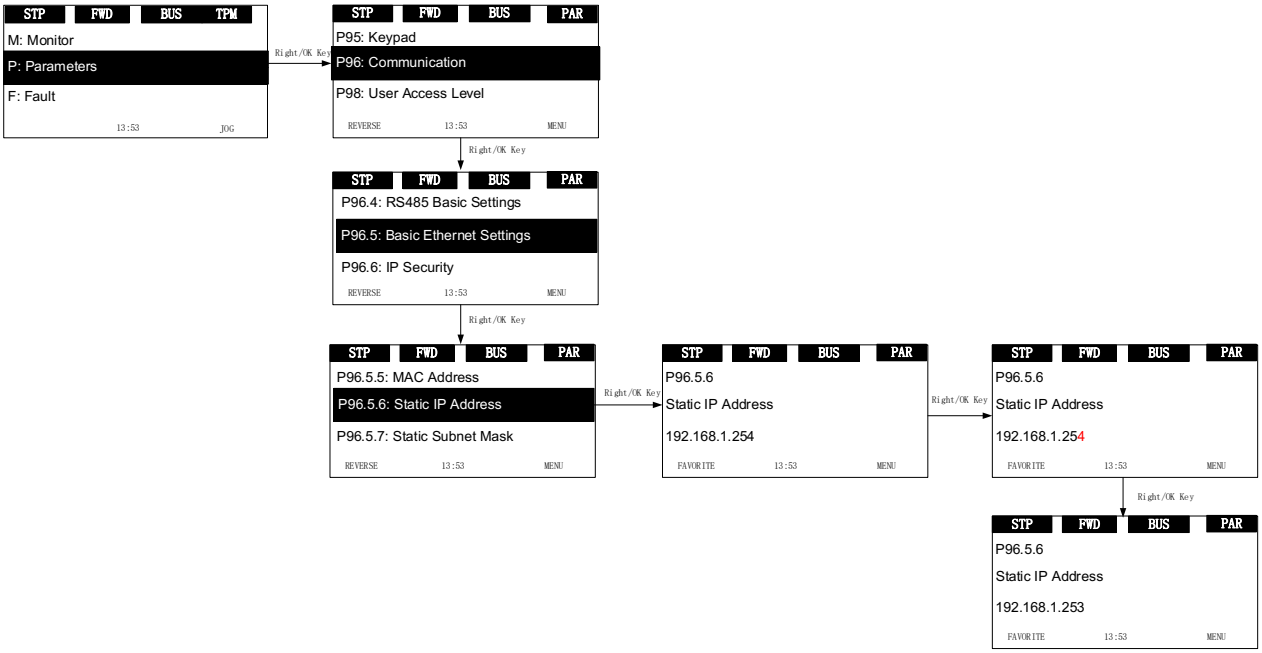
Note: Change in IP address mode will reset drive automatically to get this change effective. Also ensure device MAC address.

Figure 11. PowerXL DX1 Static IP mode

2. Using the drive keypad, set the IP address in the device to the desired address setting by.
   a. Setting Static IP Address

Figure 12. PowerXL DX1 Static IP address





b. Setting Static Subnet Mask.
c. Setting Static Default Gateway.
d. Setting Modbus TCP Unit ID.

3. Make note of the changed IP Address.
4. Using drive keypad, read “Active IP Address”, “Active Subnet Mask”, “Active Default Gateway” parameters to ensure that IP address has been set to desired IP address.

Modbus communication standards

Example of the request to read coils 2000–2003 from Slave device 18.

Table 29. Request to read coils

Item	Code	Description
Slave address	0x12	
Function code	0x01	
Start address High	0x07	Starting address 0x07D0 hex (= 2000)
Start address Low	0xD0	
Number of coils High	0x00	Number of coils 0x0003 hex (= 3)
Number of coils Low	0x03	
CRC High	0x7E	
CRC Low	0x25	

Example of the request to read Discrete Inputs 2000–2003 from Slave device 18.

Table 30. Request to read discrete inputs

Item	Code	Description
Slave address	0x12	
Function code	0x02	
Start address High	0x07	Starting address 0x07D0 hex (= 2000)
Start address Low	0xD0	
Number of Discrete Inputs High	0x00	Number of Discrete Inputs 0x0003 hex (= 3)
Number of Discrete Inputs Low	0x03	
CRC High	0x3A	
CRC Low	0x25	

Example of the request to read Holding Registers 2000–2003 from Slave device 18.

Table 31. Request to read holding registers

Item	Code	Description
Slave address	0x12	
Function code	0x03	
Start address High	0x07	Starting address 0x07D0 hex (= 2000)
Start address Low	0xD0	
Number of Holding Registers High	0x00	Number of Holding Registers 0x0003 hex (= 3)
Number of Holding Registers Low	0x03	
CRC High	0x07	
CRC Low	0xE5	

Example of the request to read Input Registers 2000–2003 from Slave device 18.

Table 32. Request to read input registers

Item	Code	Description
Slave address	0x12	
Function code	0x04	
Start address High	0x07	Starting address 0x07D0 hex (= 2000)
Start address Low	0xD0	
Number of Input Registers High	0x00	Number of Input Registers 0x0003 hex (= 3)
Number of Input Registers Low	0x03	
CRC High	0xB2	
CRC Low	0x25	

Example of the request to read exception status from Slave device 18.

Table 33. Request to read exception status

Item	Code	Description
Slave address	0x12	
Function code	0x07	
CRC High	4C	
CRC Low	D2	

Example of Read Diagnostics from Slave address 18.

Table 34. Read diagnostics

Item	Code	Description
Slave address	0x12	
Function code	0x08	
Sub function High	0x00	Sub function code 0x0000 (= 0)
Sub function Low	0x00	Note. Only support sub function code 0x0000
Data High	0xA5	Data 0xA5A5 (= 42405)
Data Low	0xA5	
CRC High	0x59	
CRC Low	0x83	

Example of the request to write single coil 2000 from Slave device 18, the output value is 1.

Table 35. Request to write single coil

Item	Code	Description
Slave address	0x12	
Function code	0x05	
Output address High	0x07	Starting address 0x07D0 hex (= 2000)
Output address Low	0xD0	
Output value High	0xFF	Output value 0xFF00 hex (= 65280)
Output value Low	0x00	Note. Output value is 0x0000 or 0xFF00
CRC High	0x8E	
CRC Low	0x14	

Example of the request to write single register 2000 from Slave device 18, the output value is 5.

Table 36. Request to write single register

Item	Code	Description
Slave address	0x12	
Function code	0x06	
Output address High	0x07	Starting address 0x07D0 hex (= 2000)
Output address Low	0xD0	
Output value High	0x00	Output value 0x0005 hex (= 5)
Output value Low	0x05	
CRC High	0x4B	
CRC Low	0xE7	

Example of Write coils 19–28 from Slave device 18.

Table 37. Write coils 19–28

Item	Code	Description
Slave Address	0x12	
Function code	0x0F	
Starting Address High	0x00	Starting Address 0x0013 (= 19)
Starting Address Low	0x13	
Quantity of Outputs High	0x00	Quantity of Outputs 0x000A (= 10)
Quantity of Outputs Low	0x0A	
Bye Count	0x02	
Outputs Value High	0xCD	
Outputs Value Low	0x01	
CRC High	0xAB	
CRC Low	0xFB	

Note: The binary outputs in the previous example correspond to the outputs in the following way.

Binary bits and corresponding outputs

Bit	1	1	0	0	1	1	0	1	0	0	0	0	0	0	0	1
Output	26	25	24	23	22	21	20	19	—	—	—	—	—	—	28	27

Example of write Holding registers 2000–2001 from Slave device 18.

Table 38. Write holding registers

Item	Code	Description
Slave Address	0x12	
Function code	0x10	
Starting Address High	0x07	Starting Address 0x07D0 (= 2000)
Starting Address Low	0xD0	
Quantity of Outputs High	0x00	Quantity of Outputs 0x0002 (= 2)
Quantity of Outputs Low	0x02	
Bye Count	0x04	
Outputs Value High	0x00	
Outputs Value Low	0x01	
Outputs Value High	0x00	
Outputs Value Low	0x02	
CRC High	0x53	
CRC Low	0x46	

Modbus registers

The variables and fault codes as well as the parameters can be read and written from Modbus. The parameter addresses are determined in the application. Every parameter and actual value have been given an ID number in the application. The ID numbering of the parameter as well as the parameter ranges and steps can be found in the application manual in question. The parameter value shall be given without decimals.

All values can be read with function codes 3 and 4 (all registers are 3X and 4X reference). Modbus registers are mapped to drive IDs as follows.

Table 39. Index table

ID	Modbus register	Group	R/W
1-98	40001-40098 30001-30098	Actual Values	1/1
100	40099(30099)	Fault Code	1/1
101-1999	40101-41999 30101-31999	Parameters	1/1
2004–2018	42004–42018 (32004–32018)	Process Data In	1/1
2104–2111	42104–42111 (32104–32111)	Process Data Out	1/1
3992-3998	43992-43998 (33992-33998)	Process Data Out	

Process data

The process data fields are used to control the drive (e.g., Run, Stop, Reference, Fault Reset) and to quickly read actual values (e.g., Output frequency, Output current, Fault code). The fields are structured as follows.

Table 40. Process data slave ⟶ master (max. 22 bytes)

ID	Modbus register	Group	Range/Type
2101	32101, 42101	FB Status Word	Binary coded
2102	32102, 42102	FB General Status Word	Binary coded
2103	32103, 42103	FB Actual Speed	0–100.00%
2104	32104, 42104	FB Process Data Out 1	Integer 16
2105	32105, 42105	FB Process Data Out 2	Integer 16
2106	32106, 42106	FB Process Data Out 3	Integer 16
2107	32107, 42107	FB Process Data Out 4	Integer 16
2108	32108, 42108	FB Process Data Out 5	Integer 16
2109	32109, 42109	FB Process Data Out 6	Integer 16
2110	32110, 42110	FB Process Data Out 7	Integer 16
2111	32111, 42111	FB Process Data Out 8	Integer 16
3992	33992,43992	FB Process Data Out 9	Integer 32
3994	33994,43994	FB Process Data Out 10	Integer 32
3996	33996,43996	FB Process Data Out 11	Integer 32
3998	33998,43998	FB Process Data Out 12	Integer 32

Table 41. Process data master ⟶ slave (max. 22 bytes)

ID	Modbus register	Group	Range/Type
2001	32001, 42001	FB Control Word	Binary coded
2002	32002, 42002	FB General Control Word	Binary coded
2003	32003, 42003	FB Speed Reference	0–100.00% Hz
2004	32004, 42004	FB Process Data In 1	Integer 16
2005	32005, 42005	FB Process Data In 2	Integer 16
2006	32006, 42006	FB Process Data In 3	Integer 16
2007	32007, 42007	FB Process Data In 4	Integer 16
2008	32008, 42008	FB Process Data In 5	Integer 16
2009	32009, 42009	FB Process Data In 6	Integer 16
2010	32010, 42010	FB Process Data In 7	Integer 16
2011	32011, 42011	FB Process Data In 8	Integer 16
2012	32012,42012	FB Process Data In 9	Integer 32
2014	32014,42014	FB Process Data In 10	Integer 32
2016	32016,42016	FB Process Data In 11	Integer 32
2018	32018,42018	FB Process Data In 12	Integer 32

The use of process data depends on the application. In a typical situation, the device is started and stopped with the ControlWord (CW) written by the Master and the Rotating speed is set with Reference (REF). With PD1–PD12 the device can be given other reference values (e.g., Torque reference).

With the StatusWord (SW) read by the Master, the status of the device can be seen. Actual Value (ACT) and PD1–PD12 show the other actual values.

Process data in

This register range is reserved for the control of the VFD. Process Data In is located in range ID 2001–2099. The registers are updated every 10 ms. See table below.

Table 42. Fieldbus basic input table

ID	Modbus register	Group	Range/Type
2001	32001, 42001	FB Control Word	Binary coded
2002	32002, 42002	FB General Control Word	Binary coded
2003	32003, 42003	FB Speed Reference	0–100.00% Hz
2004	32004, 42004	FB Process Data In 1	Integer 16
2005	32005, 42005	FB Process Data In 2	Integer 16
2006	32006, 42006	FB Process Data In 3	Integer 16
2007	32007, 42007	FB Process Data In 4	Integer 16
2008	32008, 42008	FB Process Data In 5	Integer 16
2009	32009, 42009	FB Process Data In 6	Integer 16
2010	32010, 42010	FB Process Data In 7	Integer 16
2011	32011, 42011	FB Process Data In 8	Integer 16
2012	32012,42012	FB Process Data In 9	Integer 32
2014	32014,42014	FB Process Data In 10	Integer 32
2016	32016,42016	FB Process Data In 11	Integer 32
2018	32018,42018	FB Process Data In 12	Integer 32

FB control word

The drive uses 16 bits as shown below. These bits are application specific.

Binary bits and corresponding outputs

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
[a]	[a]	INCH ON/ OFF	JOG ON/ OFF	HOA Bit 2	HOA Bit 1	FB Ref	FB Ctrl	Bypass	FB DI 4	FB DI 3	FB DI 2	FB DI 1	Fault Reset	Reverse	RUN

Note:
[a] The bit is not used.

FB general control word

The drive does not use the FB General Control Word. The main control word is used to provide commands to the drive.

Table 43. FB control word

Bit	Description Value = 0	Value = 1
0	Drive Output Off	Drive Output On
1	Clockwise Rotation	Counter Clockwise
2	No Reset	Fault Reset
3	FB INDATA1 Off	FB INDATA1 On
4	FB INDATA2 Off	FB INDATA2 On
5	FB INDATA3 Off	FB INDATA3 On
6	FB INDATA4 Off	FB INDATA4 On
7	Bypass Relay Disable	Bypass Relay Enable
8	FB Control Off	FB Control On
9	FB Reference Off	FB Reference On
10	HOA1 On (not in use)	HOA1 Off (not in use)
11	HOA2 On (not in use)	HOA2 off (not in use)
12	JOG ON/OFF	Jog On/Off
13	INCH ON/OFF	Inch On/Off
14–15	Not in use	Not in use

Speed reference

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	LSB

This is the Reference 1 to the VFD. Used normally as Speed reference.

The scaling on this value is 0–100.00% of the Maximum Frequency (P1.2). The 0 to 100.00% is represented by 0 to 10,000 value indicating 0 or 0% as Minimum Frequency (P1.1) and 10,000 or %100.00 as Maximum Frequency (P1.2). This value has 2 decimal places in it.

Process data in 1 to 8

Process Data In values 1 to 8 can be used in applications for various purposes. See below Process Data IN section for setup.

Process data out

This register range is normally used to fast monitoring of the VFD. See table below.

Table 44. Fieldbus basic output table

ID	Modbus Register	Group	Range/Type
2101	32101, 42101	FB Status Word	Binary coded
2102	32102, 42102	FB General Status Word	Binary coded
2103	32103, 42103	FB Actual Speed	%
2104	32104, 42104	FB Process Data Out 1	Integer 16
2105	32105, 42105	FB Process Data Out 2	Integer 16
2106	32106, 42106	FB Process Data Out 3	Integer 16
2107	32107, 42107	FB Process Data Out 4	Integer 16
2108	32108, 42108	FB Process Data Out 5	Integer 16
2109	32109, 42109	FB Process Data Out 6	Integer 16
2110	32110, 42110	FB Process Data Out 7	Integer 16
2111	32111, 42111	FB Process Data Out 8	Integer 16
3992	33992,43992	FB Process Data Out 9	Integer 32
3994	33994,43994	FB Process Data Out 10	Integer 32
3996	33996,43996	FB Process Data Out 11	Integer 32
3998	33998,43998	FB Process Data Out 12	Integer 32

FB status word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
—	—	—	—	Inch ON/OFF	Jog ON/OFF	HOA Status BIT 2	HOA Status BIT 1	Run_enable	Bypass	AT_reference	Warning	Fault	Direction	Running	Ready

Information about the status of the device and messages is indicated in the Status Word. The Status Word is composed of 16 bits that have the following meanings.

Table 45. FB status word bit descriptions

Bit	Description Value = 0	Value = 1
0	Not Ready	Ready
1	STOP	RUN
2	Clockwise	Counterclockwise
3	—	Faulted
4	—	Warning
5	Ref. frequency not reached	Ref. frequency reached
6	Bypass not activated	Bypass activated
7	Run disable	Run Enable
8	HOA1 Off (not in use)	HOA1 On (not in use)
9	HOA2 Off (not in use)	HOA2 On (not in use)
10	Jog off	Jog On
11	Inch Off	Inch On
12-15	Not in use	Not in use

Table 46. FB general status word 2

Bit	Description Value = 0	Value = 1
0	Inch Off	Inch On
1-15	Not in use	Not in use

Table 47. FB general status word

Bit	Description value = 0	Value = 1
Bit	"Description Value = 0"	Value = 1
0	Not Ready	Ready
1	Stop	Run
2	Clockwise	Counter Clockwise
3	No Fault	Fault
4	No Warning	Warning
5	Ref. Frequency Not Reached	Ref. Frequency Reached
6	Ref > 0 Speed	Ref = 0 speed
7	Jog Off	Jog On ①
8	Fire mode not active	Fire mode active
9	Fire mode test not active	Fire mode test active
10	IO Input not active	IO Input Active
11	DC Brake Off	DC Brake On
12	FB Ref Not Enable	FB Ref Enabled
13	FB Control Word Not Active	FB Control Word Active
14	Remote Not Enable	Remote Enable
15	OFF not active (Local/Remote is active)	OFF Active (Local & Remote is not active)

① Indicates the bit is not used.

Actual speed

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	LSB

This is the Actual Speed of the motor.This value comes back in the form of %

Process data out 1 to 12

Process Data Out values 1 to 12 can be used in application for various purposes. See below tables for additional information.

Process data OUT (slave → master)

The fieldbus master can read the VFD's actual values using process data variables. PowerXL series applications use process data as follows. These values are selectable via the Fieldbus Process Data parameter group. These values would correspond to the Modbus ID value. See **Appendix A** for Parameter ID table showing values can be set.

Table 48. Process data OUT

Id	Data	Value	Default value	Default para	Unit	Scale
2104	Process Data OUT 1	-32768–32767	1	Output Frequency	Hz	
2105	Process Data OUT 2	-32768–32767	2	Motor Speed	RPM	
2106	Process Data OUT 3	-32768–32767	3	Motor Current	A	
2107	Process Data OUT 4	-32768–32767	4	Motor Torque	%	
2108	Process Data OUT 5	-32768–32767	5	Motor Power	%	
2109	Process Data OUT 6	-32768–32767	6	Motor Voltage	V	
2110	Process Data OUT 7	-32768–32767	7	DC Link Voltage	V	
2111	Process Data OUT 8	-32768–32767	28	Latest Fault Code	—	
3992	Process Data OUT 9	-2147483648-2147483647	—	—	—	
3994	Process Data OUT 10	-2147483648-2147483647	—	—	—	
3996	Process Data OUT 11	-2147483648-2147483647	—	—	—	
3998	Process Data OUT 12	-2147483648-2147483647	—	—	—	

Process data IN (master → slave)

Process Data IN1 through Process Data IN12 change based off the selected application.

Table 49. Process data IN

ID	Data	Value	Unit	Scale
2003	Reference	Speed Reference	%	0.01
2001	Control Word	—	—	—
2004	Process Data IN1	①	—	—
2005	Process Data IN2	①	—	—
2006	Process Data IN3	①	—	—
2007	Process Data IN4	①	—	—
2008	Process Data IN5	①	—	—
2009	Process Data IN6	①	—	—
2010	Process Data IN7	①	—	—
2011	Process Data IN8	①	—	—
2012	Process Data In 9	①	—	—
2014	Process Data In 10	①	—	—
2016	Process Data In 11	①	—	—
2018	Process Data In 12	①	—	—

① Process Data IN1 through Process Data IN12 change based off the selected application.

Appendix A—Parameter ID list

Parameter descriptions

Table 50. PowerXL DX1 Parameter ID list

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
M1.1	1753	NA	NA	NA	Multi-Monitoring	INTEGER	18	x0
M2.1	1	160	1	1	Output Frequency	INTEGER	2	x100
M2.2	3912	161	1	171	Speed Reference	DOUBLE	4	x100
M2.3	3975	4	129	3	Motor Speed	DOUBLE	4	x100
M2.4	3	160	1	3	Motor Current	INTEGER	2	x10
M2.5	4	4	129	3	Motor Torque	INTEGER	2	x10
M2.6	15	160	1	10	Torque Reference	INTEGER	2	x10
M2.7	5	160	1	5	Motor Power	INTEGER	2	x10
M2.8	6	160	1	6	Motor Voltage	INTEGER	2	x10
M2.9	7	160	1	7	DC-link Voltage	INTEGER	2	x0
M2.10	8	160	1	8	Unit Temperature	INTEGER	2	x10
M2.11	9	160	1	9	Motor Temperature	INTEGER	2	x10
M2.12	28	162	1	195	Latest Fault Code	BYTE	1	x0
M2.13	1686	161	1	93	Instant Motor Power	DOUBLE	4	x1000
M2.14	1056	NA	NA	NA	v- L1/L2	INTEGER	2	x10
M2.15	1057	NA	NA	NA	v- L2/L3	INTEGER	2	x10
M2.16	1058	NA	NA	NA	v- L3/L1	INTEGER	2	x10
M2.17	3828	NA	NA	NA	I-L1	INTEGER	2	x10
M2.18	3829	NA	NA	NA	I-L2	INTEGER	2	x10
M2.19	3830	NA	NA	NA	I-L3	INTEGER	2	x10
M3.1	2445	161	1	113	Output	DOUBLE	4	x100
M3.2	2447	161	1	114	Reference	DOUBLE	4	x100
M4.1	12	NA	NA	NA	DI1, DI2, DI3	BYTE	1	x0
M4.2	13	NA	NA	NA	DI4, DI5, DI6	BYTE	1	x0
M4.3	576	NA	NA	NA	DI7, DI8	BYTE	1	x0
M4.4	14	160	1	15	DO1,Virtual RO1,Virtual RO2	BYTE	1	x0
M4.7	557	160	1	16	RO1, RO2	BYTE	1	x0
M4.8	3848	161	1	182	High Freq Pulse Input 1 Value	INTEGER	2	x0
M4.9	3861	161	1	183	High Freq Pulse Input 2 Value	INTEGER	2	x0
M4.10	3874	161	1	184	High Freq Pulse Output Value	INTEGER	2	x0
M4.11	3214	NA	NA	NA	Control board DI Status	INTEGER	2	x0
M5.1	10	160	1	11	Analog Input 1	INTEGER	2	x100
M5.2	11	160	1	12	Analog Input 2	INTEGER	2	x100
M6.1	25	160	1	13	Analog Output 1	INTEGER	2	x100
M10.1	16	160	1	17	PID1 Set Point	DOUBLE	4	x100
M10.2	18	160	1	18	PID1 Feedback	DOUBLE	4	x100
M10.3	20	160	1	19	PID1 Error Value	DOUBLE	4	x100
M10.4	22	160	1	20	PID1 Output	INTEGER	2	x100
M10.5	23	160	1	21	PID1 Status	BYTE	1	x0
M11.1	32	160	1	22	PID2 Set Point	DOUBLE	4	x100
M11.2	34	160	1	23	PID2 Feedback	DOUBLE	4	x100
M11.3	36	160	1	24	PID2 Error Value	DOUBLE	4	x100
M11.4	38	160	1	25	PID2 Output	INTEGER	2	x100
M11.5	39	160	1	26	PID2 Status	BYTE	1	x0
M14.1	3972	NA	NA	NA	SD Card Plug In	BYTE	1	x0
M41.1.1	26	160	1	27	Running Motors	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
M41.2.1	2218	NA	NA	NA	MPC Drive1 Operate Mode	BYTE	1	x0
M41.2.2	2230	NA	NA	NA	MPC Drive2 Operate Mode	BYTE	1	x0
M41.2.3	2242	NA	NA	NA	MPC Drive3 Operate Mode	BYTE	1	x0
M41.2.4	2254	NA	NA	NA	MPC Drive4 Operate Mode	BYTE	1	x0
M41.2.5	2266	NA	NA	NA	MPC Drive5 Operate Mode	BYTE	1	x0
M41.3.1	2219	NA	NA	NA	MPC Drive1 Status	BYTE	1	x0
M41.3.2	2231	NA	NA	NA	MPC Drive2 Status	BYTE	1	x0
M41.3.3	2243	NA	NA	NA	MPC Drive3 Status	BYTE	1	x0
M41.3.4	2255	NA	NA	NA	MPC Drive4 Status	BYTE	1	x0
M41.3.5	2267	NA	NA	NA	MPC Drive5 Status	BYTE	1	x0
M41.4.1	2220	NA	NA	NA	MPC Drive1 Network Status	BYTE	1	x0
M41.4.2	2232	NA	NA	NA	MPC Drive2 Network Status	BYTE	1	x0
M41.4.3	2244	NA	NA	NA	MPC Drive3 Network Status	BYTE	1	x0
M41.4.4	2256	NA	NA	NA	MPC Drive4 Network Status	BYTE	1	x0
M41.4.5	2268	NA	NA	NA	MPC Drive5 Network Status	BYTE	1	x0
M41.5.1	2221	NA	NA	NA	MPC Drive1 Last Fault Code	BYTE	1	x0
M41.5.2	2233	NA	NA	NA	MPC Drive2 Last Fault Code	BYTE	1	x0
M41.5.3	2245	NA	NA	NA	MPC Drive3 Last Fault Code	BYTE	1	x0
M41.5.4	2257	NA	NA	NA	MPC Drive4 Last Fault Code	BYTE	1	x0
M41.5.5	2269	NA	NA	NA	MPC Drive5 Last Fault Code	BYTE	1	x0
M41.6.1	2222	NA	NA	NA	MPC Drive1 f-Out	INTEGER	2	x100
M41.6.2	2234	NA	NA	NA	MPC Drive2 f-Out	INTEGER	2	x100
M41.6.3	2246	NA	NA	NA	MPC Drive3 f-Out	INTEGER	2	x100
M41.6.4	2258	NA	NA	NA	MPC Drive4 f-Out	INTEGER	2	x100
M41.6.5	2270	NA	NA	NA	MPC Drive5 f-Out	INTEGER	2	x100
M41.7.1	2223	NA	NA	NA	MPC Drive1 V-Out	INTEGER	2	x10
M41.7.2	2235	NA	NA	NA	MPC Drive2 V-Out	INTEGER	2	x10
M41.7.3	2247	NA	NA	NA	MPC Drive3 V-Out	INTEGER	2	x10
M41.7.4	2259	NA	NA	NA	MPC Drive4 V-Out	INTEGER	2	x10
M41.7.5	2271	NA	NA	NA	MPC Drive5 V-Out	INTEGER	2	x10
M41.8.1	2224	NA	NA	NA	MPC Drive1 I-Out	INTEGER	2	x10
M41.8.2	2236	NA	NA	NA	MPC Drive2 I-Out	INTEGER	2	x10
M41.8.3	2248	NA	NA	NA	MPC Drive3 I-Out	INTEGER	2	x10
M41.8.4	2260	NA	NA	NA	MPC Drive4 I-Out	INTEGER	2	x10
M41.8.5	2272	NA	NA	NA	MPC Drive5 I-Out	INTEGER	2	x10
M41.9.1	2225	NA	NA	NA	MPC Drive1 M-Out	INTEGER	2	x10
M41.9.2	2237	NA	NA	NA	MPC Drive2 M-Out	INTEGER	2	x10
M41.9.3	2249	NA	NA	NA	MPC Drive3 M-Out	INTEGER	2	x10
M41.9.4	2261	NA	NA	NA	MPC Drive4 M-Out	INTEGER	2	x10
M41.9.5	2273	NA	NA	NA	MPC Drive5 M-Out	INTEGER	2	x10
M41.10.1	2226	NA	NA	NA	MPC Drive1 P-Out	INTEGER	2	x10
M41.10.2	2238	NA	NA	NA	MPC Drive2 P-Out	INTEGER	2	x10
M41.10.3	2250	NA	NA	NA	MPC Drive3 P-Out	INTEGER	2	x10
M41.10.4	2262	NA	NA	NA	MPC Drive4 P-Out	INTEGER	2	x10
M41.10.5	2274	NA	NA	NA	MPC Drive5 P-Out	INTEGER	2	x10
M41.11.1	2227	NA	NA	NA	MPC Drive1 n-Out	INTEGER	2	x0
M41.11.2	2239	NA	NA	NA	MPC Drive2 n-Out	INTEGER	2	x0
M41.11.3	2251	NA	NA	NA	MPC Drive3 n-Out	INTEGER	2	x0
M41.11.4	2263	NA	NA	NA	MPC Drive4 n-Out	INTEGER	2	x0
M41.11.5	2275	NA	NA	NA	MPC Drive5 n-Out	INTEGER	2	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
M41.12.1	2228	NA	NA	NA	MPC Drive1 t-Run	DOUBLE	4	x10
M41.12.2	2240	NA	NA	NA	MPC Drive2 t-Run	DOUBLE	4	x10
M41.12.3	2252	NA	NA	NA	MPC Drive3 t-Run	DOUBLE	4	x10
M41.12.4	2264	NA	NA	NA	MPC Drive4 t-Run	DOUBLE	4	x10
M41.12.5	2276	NA	NA	NA	MPC Drive5 t-Run	DOUBLE	4	x10
M42.1	27	NA	NA	NA	PT100 Temperture	INTEGER	2	x10
M43.1	3248	162	1	71	SlotA DI Status	INTEGER	2	x0
M43.2	3249	162	1	118	SlotB DI Status	INTEGER	2	x0
M43.3	3653	162	1	166	SlotC DI Status	INTEGER	2	x0
M43.4	3766	162	1	193	SlotD DI Status	INTEGER	2	x0
M96.1	2209	162	1	194	Control Board DIDO Status	INTEGER	2	x0
M96.2	29	160	1	28	Application Status Word	INTEGER	2	x0
M96.3	2414	161	1	100	Standard Status Word	INTEGER	2	x0
M96.4	2101	161	1	109	FB Status Word	INTEGER	2	x0
M96.5	2001	161	1	110	FB Control Word	INTEGER	2	x0
M96.6	2003	4	123	3	FB Speed Reference	INTEGER	2	x100
M96.7	2541	161	1	112	FB Torque Ref	INTEGER	2	x10
M97.1	2120	NA	NA	NA	Energy Savings	DOUBLE	4	x1000
M98.1	601	NA	NA	NA	Total MWh Count	DOUBLE	4	x10000
M98.2	603	NA	NA	NA	Total Power Day Count	INTEGER	2	x0
M98.3	606	NA	NA	NA	Total Power Hr Count	DOUBLE	4	x0
M98.4	604	NA	NA	NA	Trip MWh Count	DOUBLE	4	x10000
M98.6	636	NA	NA	NA	Trip Power Day Count	INTEGER	2	x0
M98.7	637	NA	NA	NA	Trip Power Hr Count	DOUBLE	4	x0
M99.1	2827	NA	NA	NA	Total Run Time Count	DOUBLE	4	x10
M99.2	2829	NA	NA	NA	Trip Run Time Count	INTEGER	2	x10
M99.3	2830	NA	NA	NA	Numbers Of Start	INTEGER	2	x0
P1.1	3916	160	1	64	Min Speed	DOUBLE	4	x100
P1.2	3918	160	1	65	Max Speed	DOUBLE	4	x100
P1.3	103	160	1	66	Accel Time 1	INTEGER	2	x10
P1.4	104	160	1	67	Decel Time 1	INTEGER	2	x10
P1.5	1820	NA	NA	NA	Motor Type Selection	BYTE	1	x0
P1.6	486	40	2	6	Motor Nom Current	INTEGER	2	x10
P1.7	489	40	2	15	Motor Nom Speed	INTEGER	2	x0
P1.8	490	160	1	212	Motor PF	INTEGER	2	x100
P1.9	487	40	2	7	Motor Nom Voltage	INTEGER	2	x0
P1.10	488	160	1	213	Motor Nom Frequency	INTEGER	2	x100
P1.11	1695	160	1	59	Local Control Place	BYTE	1	x0
P1.12	136	160	1	60	Local Reference	BYTE	1	x0
P1.13	135	160	1	57	Remote 1 Control Place	BYTE	1	x0
P1.14	137	160	1	61	Remote 1 Reference	BYTE	1	x0
P1.15	2840	NA	NA	NA	Frequency Reference Upper Limit	INTEGER	2	x100
P1.16	2841	NA	NA	NA	Frequency Reference Upper Limit Source	BYTE	1	x0
P2.1.1	144	NA	NA	NA	AI Ref Scale Min Value	INTEGER	2	x100
P2.1.2	145	NA	NA	NA	AI Ref Scale Max Value	INTEGER	2	x100
P2.1.6	2484	NA	NA	NA	Fine Tuning Input	BYTE	1	x0
P2.1.7	2485	NA	NA	NA	Fine Tuning Min	INTEGER	2	x10
P2.1.8	2486	NA	NA	NA	Fine Tuning Max	INTEGER	2	x10
P2.2.1	222	NA	NA	NA	AI1 Mode	BYTE	1	x0
P2.2.2	175	NA	NA	NA	AI1 Signal Range	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
P2.2.3	176	NA	NA	NA	AI1 Custom Min	INTEGER	2	x100
P2.2.4	177	NA	NA	NA	AI1 Custom Max	INTEGER	2	x100
P2.2.5	174	NA	NA	NA	AI1 Filter Time	INTEGER	2	x100
P2.2.6	181	NA	NA	NA	AI1 Signal Invert	BYTE	1	x0
P2.2.7	178	NA	NA	NA	AI1 Joystick Hyst	INTEGER	2	x100
P2.2.8	179	NA	NA	NA	AI1 Sleep Limit	INTEGER	2	x100
P2.2.9	180	NA	NA	NA	AI1 Sleep Delay	INTEGER	2	x100
P2.2.10	133	NA	NA	NA	AI1 Joystick Offset	INTEGER	2	x100
P2.2.11	3775	NA	NA	NA	Analog Input 1 Scale	INTEGER	2	x0
P2.2.12	3776	NA	NA	NA	Analog Input 1 Offset	INTEGER	2	x100
P2.3.1	223	NA	NA	NA	AI2 Mode	BYTE	1	x0
P2.3.2	183	NA	NA	NA	AI2 Signal Range	BYTE	1	x0
P2.3.3	184	NA	NA	NA	AI2 Custom Min	INTEGER	2	x100
P2.3.4	185	NA	NA	NA	AI2 Custom Max	INTEGER	2	x100
P2.3.5	182	NA	NA	NA	AI2 Filter Time	INTEGER	2	x100
P2.3.6	189	NA	NA	NA	AI2 Signal Invert	BYTE	1	x0
P2.3.7	186	NA	NA	NA	AI2 Joystick Hyst	INTEGER	2	x100
P2.3.8	187	NA	NA	NA	AI2 Sleep Limit	INTEGER	2	x100
P2.3.9	188	NA	NA	NA	AI2 Sleep Delay	INTEGER	2	x100
P2.3.10	134	NA	NA	NA	AI2 Joystick Offset	INTEGER	2	x100
P2.3.11	3777	NA	NA	NA	Analog Input 2 Scale	INTEGER	2	x0
P2.3.12	3778	NA	NA	NA	Analog Input 2 Offset	INTEGER	2	x100
P3.3.1	3970	NA	NA	NA	CMA To GND Enable	BYTE	1	x0
P3.3.2	3971	NA	NA	NA	CMB To GND Enable	BYTE	1	x0
P3.4.1.1	3843	NA	NA	NA	High Freq Pulse Input 1 Type	BYTE	1	x0
P3.4.2.1	3844	NA	NA	NA	High Freq Pulse Input 1 Func	BYTE	1	x0
P3.4.2.2	3845	NA	NA	NA	High Freq Pulse Input 1 Scale	INTEGER	2	x0
P3.4.2.3	3846	NA	NA	NA	High Freq Pulse Input 1 Offset	INTEGER	2	x100
P3.4.2.4	3847	NA	NA	NA	High Freq Pulse Input 1 Filter Time	INTEGER	2	x0
P3.4.2.5	3849	NA	NA	NA	High Freq Pulse Input 1 Min	INTEGER	2	x0
P3.4.2.6	3850	NA	NA	NA	High Freq Pulse Input 1 Max	INTEGER	2	x0
P3.4.2.7	3851	NA	NA	NA	High Freq Pulse Input 1 Fault	BYTE	1	x0
P3.4.2.8	3852	NA	NA	NA	High Freq Pulse Input 1 Low Limit	INTEGER	2	x0
P3.4.2.9	3853	NA	NA	NA	High Freq Pulse Input 1 High Limit	INTEGER	2	x0
P3.4.2.10	3854	NA	NA	NA	High Freq Pulse Input 1 Check Delay	INTEGER	2	x0
P3.4.2.11	3855	NA	NA	NA	High Freq Pulse Input 1 Hyst Level	INTEGER	2	x0
P3.5.1.1	3856	NA	NA	NA	High Freq Pulse Input 2 Type	BYTE	1	x0
P3.5.2.1	3857	NA	NA	NA	High Freq Pulse Input 2 Func	BYTE	1	x0
P3.5.2.2	3858	NA	NA	NA	High Freq Pulse Input 2 Scale	INTEGER	2	x0
P3.5.2.3	3859	NA	NA	NA	High Freq Pulse Input 2 Offset	INTEGER	2	x100
P3.5.2.4	3860	NA	NA	NA	High Freq Pulse Input 2 Filter Time	INTEGER	2	x0
P3.5.2.5	3862	NA	NA	NA	High Freq Pulse Input 2 Min	INTEGER	2	x0
P3.5.2.6	3863	NA	NA	NA	High Freq Pulse Input 2 Max	INTEGER	2	x0
P3.5.2.7	3864	NA	NA	NA	High Freq Pulse Input 2 Fault	BYTE	1	x0
P3.5.2.8	3865	NA	NA	NA	High Freq Pulse Input 2 Low Limit	INTEGER	2	x0
P3.5.2.9	3866	NA	NA	NA	High Freq Pulse Input 2 High Limit	INTEGER	2	x0
P3.5.2.10	3867	NA	NA	NA	High Freq Pulse Input 2 Check Delay	INTEGER	2	x0
P3.5.2.11	3868	NA	NA	NA	High Freq Pulse Input 2 Hyst level	INTEGER	2	x0
P4.2.1	227	NA	NA	NA	AO1 Mode	BYTE	1	x0
P4.2.2	146	160	1	43	AO1 Function	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
P4.2.3	147	NA	NA	NA	AO1 Filter Time	INTEGER	2	x100
P4.2.8	149	162	1	209	AO1 Minimum	BYTE	1	x0
P4.2.9	150	162	1	210	AO1 Scale	INTEGER	2	x0
P4.2.10	148	162	1	211	AO1 Inversion	BYTE	1	x0
P4.2.11	173	162	1	212	AO1 Offset	INTEGER	2	x100
P5.1.1	152	160	1	46	RO1 Function	BYTE	1	x0
P5.1.2	2112	162	1	213	RO1 On Delay	INTEGER	2	x10
P5.1.3	2113	162	1	214	RO1 Off Delay	INTEGER	2	x10
P5.1.4	153	160	1	47	RO2 Function	BYTE	1	x0
P5.1.5	2114	162	1	215	RO2 On Delay	INTEGER	2	x10
P5.1.6	2115	162	1	216	RO2 Off Delay	INTEGER	2	x10
P5.2.1	151	160	1	45	DO1 Function	BYTE	1	x0
P5.3.1	2463	161	1	123	Virtual RO1 Function	BYTE	1	x0
P5.3.2	2848	NA	NA	NA	Virtual RO1 On Delay	INTEGER	2	x10
P5.3.3	2849	NA	NA	NA	Virtual RO1 Off Delay	INTEGER	2	x10
P5.3.4	2464	161	1	124	Virtual RO2 Function	BYTE	1	x0
P5.3.5	2850	NA	NA	NA	Virtual RO2 On Delay	INTEGER	2	x10
P5.3.6	2851	NA	NA	NA	Virtual RO2 Off Delay	INTEGER	2	x10
P5.4.1.1	3869	161	1	185	High Freq Pulse Output Type	BYTE	1	x0
P5.4.2.1	3870	161	1	186	High Freq Pulse Output Source	BYTE	1	x0
P5.4.2.2	3871	161	1	187	High Freq Pulse Output Scale	INTEGER	2	x0
P5.4.2.3	3872	161	1	188	High Freq Pulse Output Offset	INTEGER	2	x100
P5.4.2.4	3873	161	1	189	High Freq Pulse Output Filter Time	INTEGER	2	x0
P5.4.2.5	3875	161	1	190	High Freq Pulse Output Min	INTEGER	2	x0
P5.4.2.6	3876	161	1	191	High Freq Pulse Output Max	INTEGER	2	x0
P5.4.2.7	3877	161	1	192	High Freq Pulse Output Fault	BYTE	1	x0
P5.4.2.8	3878	161	1	193	High Freq Pulse Output Low Limit	INTEGER	2	x0
P5.4.2.9	3879	161	1	194	High Freq Pulse Output High Limit	INTEGER	2	x0
P5.4.2.10	3880	161	1	195	High Freq Pulse Output Check Delay	INTEGER	2	x0
P5.4.2.11	3881	161	1	196	High Freq Pulse Output Hyst Level	INTEGER	2	x0
P7.1.1	143	162	1	217	IO Terminal 1 Start Stop Logic	BYTE	1	x0
P7.1.2	190	162	1	218	IO Terminal 1 Start Signal 1	BYTE	1	x0
P7.1.3	191	162	1	219	IO Terminal 1 Start Signal 2	BYTE	1	x0
P7.1.4	2206	162	1	220	IO Terminal 2 Start Stop Logic	BYTE	1	x0
P7.1.5	2207	162	1	221	IO Terminal 2 Start Signal 1	BYTE	1	x0
P7.1.6	2208	162	1	222	IO Terminal 2 Start Signal 2	BYTE	1	x0
P7.1.7	198	162	1	223	Reverse	BYTE	1	x0
P7.1.8	1679	161	1	175	Reverse Enable	BYTE	1	x0
P7.1.9	194	162	1	246	Run Enable	BYTE	1	x0
P7.1.10	2667	161	1	181	Run Remove Stop Mode	BYTE	1	x0
P7.1.12	200	162	1	225	Fault Reset	BYTE	1	x0
P7.1.13	252	162	1	226	Start Mode	BYTE	1	x0
P7.1.14	253	162	1	227	Stop Mode	BYTE	1	x0
P7.1.15	2483	162	1	228	Fault Reset Start	BYTE	1	x0
P7.1.16	267	162	1	229	Power Loss Function	BYTE	1	x0
P7.1.17	268	162	1	230	Power Loss Time	INTEGER	2	x10
P7.1.18	2462	162	1	231	Bumpless Enable	BYTE	1	x0
P7.1.19	2522	161	1	197	Switching Frequency	INTEGER	2	x10
P7.1.20	1665	162	1	232	Sine Filter Enable	BYTE	1	x0
P7.1.21	747	162	1	233	Ext Fault-AR	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
P7.1.22	2465	161	1	116	HOA Source	BYTE	1	x0
P7.2.1	3916	160	1	64	Min Speed	DOUBLE	4	x100
P7.2.2	3918	160	1	65	Max Speed	DOUBLE	4	x100
P7.2.3	3914	160	1	63	Keypad Reference	DOUBLE	4	x100
P7.2.4	782	160	1	241	Keypad Torque Ref	INTEGER	2	x10
P7.2.5	208	162	1	234	AI Ref Source Select	BYTE	1	x0
P7.2.6	205	162	1	235	Preset Speed B0	BYTE	1	x0
P7.2.7	206	162	1	236	Preset Speed B1	BYTE	1	x0
P7.2.8	207	162	1	237	Preset Speed B2	BYTE	1	x0
P7.2.9	117	162	1	238	Jog Reference	INTEGER	2	x100
P7.2.10	156	162	1	239	Motor Pot Ramp Time	INTEGER	2	x10
P7.2.11	169	162	1	240	Motor Pot Ref Reset	BYTE	1	x0
P7.2.12	2515	NA	NA	NA	Change PhaseSequence Motor	BYTE	1	x0
P7.2.13	203	162	1	241	Accel Pot Value	BYTE	1	x0
P7.2.14	204	162	1	242	Decel Pot Value	BYTE	1	x0
P7.2.15	216	162	1	243	Reset Pot Zero	BYTE	1	x0
P7.2.16	4011	162	1	196	Speed Trim Setting	BYTE	1	x0
P7.2.17	4012	162	1	197	Torque Trim Setting	BYTE	1	x0
P7.3.1	1685	161	1	92	Power Up Local Remote Select	BYTE	1	x0
P7.3.2	209	160	1	38	Remote 1/2 Select	BYTE	1	x0
P7.3.5	2395	161	1	122	HOA On/Off	BYTE	1	x0
P7.3.6	197	160	1	37	Local Control	BYTE	1	x0
P7.3.7	196	160	1	36	Remote Control	BYTE	1	x0
P7.3.8	1695	160	1	59	Local Control Place	BYTE	1	x0
P7.3.9	136	160	1	60	Local Reference	BYTE	1	x0
P7.3.10	135	160	1	57	Remote 1 Control Place	BYTE	1	x0
P7.3.11	137	160	1	61	Remote 1 Reference	BYTE	1	x0
P7.3.12	138	160	1	58	Remote 2 Control Place	BYTE	1	x0
P7.3.13	139	160	1	62	Remote 2 Reference	BYTE	1	x0
P7.4.1	195	160	1	33	Accel/Decel Time Set	BYTE	1	x0
P7.4.4	201	160	1	34	Accel/Decel Prohibit	BYTE	1	x0
P7.4.5	103	160	1	66	Accel Time 1	INTEGER	2	x10
P7.4.6	104	160	1	67	Decel Time 1	INTEGER	2	x10
P7.4.7	247	160	1	68	Ramp 1 Shape	INTEGER	2	x10
P7.4.8	249	160	1	69	Accel Time 2	INTEGER	2	x10
P7.4.9	250	160	1	70	Decel Time 2	INTEGER	2	x10
P7.4.10	248	160	1	71	Ramp 2 Shape	INTEGER	2	x10
P7.4.11	2444	161	1	131	2nd Stage Ramp Frequency	INTEGER	2	x100
P7.5.1	3932	NA	NA	NA	Preset Speed 1	DOUBLE	4	x100
P7.5.2	3934	NA	NA	NA	Preset Speed 2	DOUBLE	4	x100
P7.5.3	3936	NA	NA	NA	Preset Speed 3	DOUBLE	4	x100
P7.5.4	3938	NA	NA	NA	Preset Speed 4	DOUBLE	4	x100
P7.5.5	3940	NA	NA	NA	Preset Speed 5	DOUBLE	4	x100
P7.5.6	3942	NA	NA	NA	Preset Speed 6	DOUBLE	4	x100
P7.5.7	3944	NA	NA	NA	Preset Speed 7	DOUBLE	4	x100
P7.6.1	321	160	1	93	AR Wait Time	INTEGER	2	x100
P7.6.2	322	160	1	94	AR Trail Time	INTEGER	2	x100
P7.6.3	323	160	1	95	AR Start Function	BYTE	1	x0
P7.6.4	324	160	1	96	Undervoltage Attempts	BYTE	1	x0
P7.6.5	325	160	1	97	OverVoltage Attempts	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
P7.6.6	326	160	1	98	OverCurrent Attempts	BYTE	1	x0
P7.6.7	327	160	1	99	4mA Fault Attempts	BYTE	1	x0
P7.6.8	329	160	1	100	Motor Temp Fault Attempts	BYTE	1	x0
P7.6.9	328	160	1	101	External Fault Attempts	BYTE	1	x0
P7.6.10	336	160	1	102	Underload Attempts	BYTE	1	x0
P7.6.11	3842	162	1	198	Number Of Tries After AI Trip	BYTE	1	x0
P7.7.1	2126	161	1	94	Cold Weather Mode	BYTE	1	x0
P7.7.2	2127	161	1	95	Cold Weather Volt. Level	BYTE	1	x10
P7.7.3	2128	161	1	96	Cold Weather Time Out	BYTE	1	x0
P7.7.4	2129	161	1	97	Cold Weather Password	INTEGER	2	x0
P8.1.1	287	160	1	201	Motor Control Mode	BYTE	1	x0
P8.1.2	107	42	1	10	Current Limit	INTEGER	2	x10
P8.1.3	217	160	1	39	Second Motor Para Select	BYTE	1	x0
P8.1.4	3767	162	1	19	Encoder Signal Selection	BYTE	1	x0
P8.1.5	3837	162	1	20	Encoder 1 Scale	INTEGER	2	x1000
P8.1.6	3838	162	1	21	Encoder 2 Scale	INTEGER	2	x1000
P8.2.1	264	NA	NA	NA	Skip Range Ramp Factor	INTEGER	2	x10
P8.2.2	3920	NA	NA	NA	Skip F1 Low Limit	DOUBLE	4	x100
P8.2.3	3922	NA	NA	NA	Skip F1 High Limit	DOUBLE	4	x100
P8.2.4	3924	NA	NA	NA	Skip F2 Low Limit	DOUBLE	4	x100
P8.2.5	3926	NA	NA	NA	Skip F2 High Limit	DOUBLE	4	x100
P8.2.6	3928	NA	NA	NA	Skip F3 Low Limit	DOUBLE	4	x100
P8.2.7	3930	NA	NA	NA	Skip F3 High Limit	DOUBLE	4	x100
P8.3.1	2159	NA	NA	NA	Preheat Mode	BYTE	1	x0
P8.3.2	2160	NA	NA	NA	Preheat Control Source	BYTE	1	x0
P8.3.3	2161	NA	NA	NA	Preheat Enter Temp	INTEGER	2	x10
P8.3.4	2162	NA	NA	NA	Preheat Quit Temp	INTEGER	2	x10
P8.10.1	1820	NA	NA	NA	Motor Type Selection	BYTE	1	x0
P8.10.2	486	40	2	6	Motor Nom Current	INTEGER	2	x10
P8.10.3	489	40	2	15	Motor Nom Speed	INTEGER	2	x0
P8.10.4	490	160	1	212	Motor PF	INTEGER	2	x100
P8.10.5	487	40	2	7	Motor Nom Voltage	INTEGER	2	x0
P8.10.6	488	160	1	213	Motor Nom Frequency	INTEGER	2	x100
P8.10.8	299	NA	NA	NA	Identification	BYTE	1	x0
P8.10.9	771	NA	NA	NA	Stator Resistor	INTEGER	2	x1000
P8.10.10	772	NA	NA	NA	Rotor Resistor	INTEGER	2	x1000
P8.10.11	773	NA	NA	NA	Leak Inductance	INTEGER	2	x100
P8.10.14	774	NA	NA	NA	Mutual Inductance	INTEGER	2	x10
P8.10.15	775	NA	NA	NA	Excitation Current	INTEGER	2	x10
P8.10.16	1882	161	1	176	PM BEMF Voltage	INTEGER	2	x0
P8.10.17	1883	161	1	177	PM q-axis stator inductance	INTEGER	2	x0
P8.10.18	1884	161	1	178	PM d-axis stator inductance	INTEGER	2	x0
P8.10.19	2837	161	1	180	Motor Inertia	INTEGER	2	x1000
P8.10.20	2901	161	1	179	Observer Kp	INTEGER	2	x0
P8.11.1	3276	NA	NA	NA	Motor 2 Type Selection	BYTE	1	x0
P8.11.2	577	40	3	6	Motor Nom Current 2	INTEGER	2	x10
P8.11.3	578	40	3	15	Motor Nom Speed 2	INTEGER	2	x0
P8.11.4	579	160	1	217	Motor PF 2	INTEGER	2	x100
P8.11.5	580	40	3	7	Motor Nom Volt 2	INTEGER	2	x0
P8.11.6	581	160	1	218	Motor Nom Freq 2	INTEGER	2	x100

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
P8.11.9	1419	NA	NA	NA	Stator Resistor 2	INTEGER	2	x1000
P8.11.10	1420	NA	NA	NA	Rotor Resistor 2	INTEGER	2	x1000
P8.11.11	1421	NA	NA	NA	Leak Inductance 2	INTEGER	2	x100
P8.11.14	1422	NA	NA	NA	Mutual Inductance 2	INTEGER	2	x10
P8.11.15	1423	NA	NA	NA	Excitation Current 2	INTEGER	2	x10
P8.11.16	2842	161	1	198	Second PM BEMF Voltage	INTEGER	2	x0
P8.11.17	2843	NA	NA	NA	Second PM q-axis Stator Inductance	INTEGER	2	x0
P8.11.18	2844	NA	NA	NA	Second PM d-axis Stator Inductance	INTEGER	2	x0
P8.11.19	2838	NA	NA	NA	Motor Inertia2	INTEGER	2	x1000
P8.20.1	109	NA	NA	NA	V/Hz Optimization	BYTE	1	x0
P8.20.2	108	NA	NA	NA	V/Hz Ratio	BYTE	1	x0
P8.20.3	289	NA	NA	NA	Field Weakening Point	INTEGER	2	x100
P8.20.4	290	NA	NA	NA	Voltage At FWP	INTEGER	2	x100
P8.20.5	291	NA	NA	NA	V/Hz Mid Frequency	INTEGER	2	x100
P8.20.6	292	NA	NA	NA	V/Hz Mid Voltage	INTEGER	2	x100
P8.20.7	293	NA	NA	NA	Zero Frequency Voltage	INTEGER	2	x100
P8.20.8	294	NA	NA	NA	OverVoltage Control	BYTE	1	x0
P8.20.9	1874	NA	NA	NA	Over Voltage Controller Reference	INTEGER	2	x0
P8.20.10	298	NA	NA	NA	Load Drooping	INTEGER	2	x100
P8.20.11	1630	NA	NA	NA	Droop Control Filter Time Constant	INTEGER	2	x0
P8.20.12	1664	NA	NA	NA	Slip Compensation Coefficient	INTEGER	2	x0
P8.20.13	1656	NA	NA	NA	V/F Stable Kd	INTEGER	2	x0
P8.20.14	1657	NA	NA	NA	V/F Stable Kq	INTEGER	2	x0
P8.20.15	2835	NA	NA	NA	Overmodulation Enable	BYTE	1	x0
P8.20.16	1762	NA	NA	NA	Pulse Off Frequency	BYTE	1	x0
P8.21.1	1591	161	1	54	Speed Error Filter Time Constant	INTEGER	2	x0
P8.21.2	1593	161	1	56	Speed Control Kp0	INTEGER	2	x10
P8.21.3	1594	161	1	57	Speed Control Ti0	INTEGER	2	x10
P8.21.4	3946	161	1	60	Speed Control F0	DOUBLE	4	x100
P8.21.5	3948	161	1	61	Speed Control F1	DOUBLE	4	x100
P8.21.6	1599	161	1	62	Speed Control Kp1	INTEGER	2	x10
P8.21.7	1600	161	1	63	Speed Control Ti1	INTEGER	2	x10
P8.21.8	1607	NA	NA	NA	Motoring Power Limit	INTEGER	2	x10
P8.21.9	1608	NA	NA	NA	Generator Power Limit	INTEGER	2	x10
P8.21.10	1620	161	1	72	Flux Reference	INTEGER	2	x10
P8.21.11	1623	161	1	75	Flux Current Ramp Time	INTEGER	2	x0
P8.21.12	1574	161	1	51	Neg Speed Limit	DOUBLE	4	x100
P8.21.13	1576	161	1	52	Pos Speed Limit	DOUBLE	4	x100
P8.21.14	1585	161	1	53	Frequency Ramp Out FilterTime Constant	INTEGER	2	x0
P8.21.25	3962	NA	NA	NA	Speed Reg BW0	INTEGER	2	x100
P8.21.26	3963	NA	NA	NA	Speed Reg BW1	INTEGER	2	x100
P8.21.27	4000	NA	NA	NA	Id Kp0	INTEGER	2	x10
P8.21.28	4001	NA	NA	NA	Id Ti0	INTEGER	2	x10
P8.21.29	4002	NA	NA	NA	Iq Kp0	INTEGER	2	x10
P8.21.30	4003	NA	NA	NA	Iq Ti0	INTEGER	2	x10
P8.21.31	4004	NA	NA	NA	Id Kp1	INTEGER	2	x10
P8.21.32	4005	NA	NA	NA	Id Ti1	INTEGER	2	x10
P8.21.33	4006	NA	NA	NA	Iq Kp1	INTEGER	2	x10
P8.21.34	4007	NA	NA	NA	Iq Ti1	INTEGER	2	x10
P8.21.35	4008	NA	NA	NA	Current Control F0	INTEGER	2	x100

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
P8.21.36	4009	NA	NA	NA	Current Control F1	INTEGER	2	x100
P8.22.5	1631	161	1	78	Startup Torque Selection	INTEGER	2	x0
P8.22.6	1602	161	1	65	Motoring Torque Limit	INTEGER	2	x10
P8.22.7	1603	161	1	66	Generator Torque Limit	INTEGER	2	x10
P8.22.8	1604	161	1	67	Torque Limit Forward	INTEGER	2	x10
P8.22.9	1605	161	1	68	Torque Limit Reverse	INTEGER	2	x10
P8.22.10	1632	161	1	79	Torque Memory Start	INTEGER	2	x10
P8.22.11	1633	161	1	80	Startup Torque Forward	INTEGER	2	x10
P8.22.12	1634	161	1	81	Startup Torque Reverse	INTEGER	2	x10
P8.22.13	1635	161	1	82	Startup Torque Actual	INTEGER	2	x10
P8.22.14	1667	161	1	88	Startup Torque Time	INTEGER	2	x0
P8.22.15	295	160	1	202	Torque Limit	INTEGER	2	x10
P8.22.16	1606	161	1	69	Pull Out Torque	INTEGER	2	x10
P8.22.17	303	160	1	203	Torque Ref Select	BYTE	1	x0
P8.22.18	304	160	1	204	Torque Ref Max	INTEGER	2	x10
P8.22.19	305	160	1	205	Torque Ref Min	INTEGER	2	x10
P8.22.20	1640	161	1	87	Torque Reference Filter TC	INTEGER	2	x0
P8.22.21	1666	161	1	89	Speed Limiter Mode	BYTE	1	x0
P8.22.22	3950	161	1	83	Window Pos Width	DOUBLE	4	x100
P8.22.23	3952	161	1	84	Window Neg Width	DOUBLE	4	x100
P8.22.24	3954	161	1	85	Window Pos Off Limit	DOUBLE	4	x100
P8.22.25	3956	161	1	86	Window Neg Off Limit	DOUBLE	4	x100
P8.22.26	1684	161	1	91	Stop State Magnetisation Time	INTEGER	2	x0
P8.23.1	1890	NA	NA	NA	PM Initial Selection	BYTE	1	x0
P8.23.2	1891	NA	NA	NA	PM Initial Time	INTEGER	2	x0
P8.23.3	1892	NA	NA	NA	PM Excited Current	INTEGER	2	x0
P8.23.4	1893	NA	NA	NA	PM Excited Current Off Frequency	INTEGER	2	x0
P10.1.1	550	160	1	31	PID1 Control Enable	BYTE	1	x0
P10.1.2	351	160	1	40	PID1 Set Point Select	BYTE	1	x0
P10.2.1	1294	160	1	103	PID1 Control Gain	INTEGER	2	x100
P10.2.2	1295	160	1	104	PID1 Control ITime	INTEGER	2	x100
P10.2.3	1296	160	1	105	PID1 Control DTime	INTEGER	2	x100
P10.2.4	1297	160	1	106	PID1 Process Unit	BYTE	1	x0
P10.2.5	1298	160	1	108	PID1 Process Unit Min	DOUBLE	4	x100
P10.2.6	1300	160	1	109	PID1 Process Unit Max	DOUBLE	4	x100
P10.2.7	1302	160	1	107	PID1 Process Unit Decimal	BYTE	1	x0
P10.2.8	1303	160	1	110	PID1 Error Inversion	BYTE	1	x0
P10.2.9	1304	160	1	111	PID1 Dead Band	DOUBLE	4	x100
P10.2.10	1306	160	1	112	PID1 Dead Band Delay	INTEGER	2	x100
P10.2.11	1311	160	1	113	PID1 Ramp Time	INTEGER	2	x100
P10.2.12	4013	161	1	199	PID1 Output Min	INTEGER	2	x100
P10.2.13	4014	161	1	200	PID1 Output Max	INTEGER	2	x100
P10.3.1	1307	NA	NA	NA	PID1 Keypad Set Point 1	DOUBLE	4	x100
P10.3.2	1309	NA	NA	NA	PID1 Keypad Set Point 2	DOUBLE	4	x100
P10.3.3	2466	161	1	142	PID1 Wake Up Action	BYTE	1	x0
P10.3.4	2660	161	1	201	PID1 Sleep Boost level	INTEGER	2	x0
P10.3.5	2661	161	1	202	PID1 Sleep Boost Max Time	INTEGER	2	x0
P10.4.1	1312	160	1	114	PID1 Set Point 1 Source	BYTE	1	x0
P10.4.2	1315	160	1	117	PID1 Set Point 1 Sleep Enable	BYTE	1	x0
P10.4.3	1317	160	1	118	PID1 Set Point 1 Sleep Delay	INTEGER	2	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
P10.4.4	1318	160	1	119	PID1 Set Point 1 Wake Up Level	DOUBLE	4	x100
P10.4.5	1320	160	1	120	PID1 Set Point 1 Boost	BYTE	1	x10
P10.4.6	2450	161	1	139	PID1 Set Point 1 Sleep Level	DOUBLE	4	x100
P10.4.9	1313	160	1	115	PID1 Set Point 1 Min	INTEGER	2	x100
P10.4.10	1314	160	1	116	PID1 Set Point 1 Max	INTEGER	2	x100
P10.4.11	2396	161	1	138	PID1 Set Point 1 Sleep Unit Sel	BYTE	1	x0
P10.4.12	1352	160	1	148	PID1 Set Point 1 Comp Enable	BYTE	1	x0
P10.4.13	1353	160	1	149	PID1 Set Point 1 Comp Max	INTEGER	2	x100
P10.5.1	1321	160	1	121	PID1 Set Point 2 Source	BYTE	1	x0
P10.5.2	1324	160	1	124	PID1 Set Point 2 Sleep Enable	BYTE	1	x0
P10.5.3	1326	160	1	125	PID1 Set Point 2 Sleep Delay	INTEGER	2	x0
P10.5.4	1327	160	1	126	PID1 Set Point 2 Wake Up Level	DOUBLE	4	x100
P10.5.5	1329	160	1	127	PID1 Set Point 2 Boost	BYTE	1	x10
P10.5.6	2452	161	1	141	PID1 Set Point 2 Sleep Level	DOUBLE	4	x100
P10.5.9	1322	160	1	122	PID1 Set Point 2 Min	INTEGER	2	x100
P10.5.10	1323	160	1	123	PID1 Set Point 2 Max	INTEGER	2	x100
P10.5.11	2397	161	1	140	PID1 Set Point 2 Sleep Unit Sel	BYTE	1	x0
P10.5.12	1354	160	1	150	PID1 Set Point 2 Comp Enable	BYTE	1	x0
P10.5.13	1355	160	1	151	PID1 Set Point 2 Comp Max	INTEGER	2	x100
P10.6.1	2542	161	1	143	FB PID1 Set Point 1	DOUBLE	4	x100
P10.6.2	2544	161	1	144	FB PID1 Set Point 2	DOUBLE	4	x100
P10.6.3	2550	161	1	145	FB PID1 Feedback 1	INTEGER	2	x100
P10.6.4	2551	161	1	146	FB PID1 Feedback 2	INTEGER	2	x100
P10.6.5	2554	161	1	147	FB PID1 Feedforward 1	INTEGER	2	x100
P10.6.6	2555	161	1	148	FB PID1 Feedforward 2	INTEGER	2	x100
P10.7.1	1331	160	1	129	PID1 Feedback Gain	INTEGER	2	x10
P10.7.2	1330	160	1	128	PID1 Feedback Function	BYTE	1	x0
P10.7.3	2811	161	1	203	PID1 Low Feedback Level	INTEGER	2	x10
P10.7.4	2812	161	1	204	PID1 Low Feedback Time	INTEGER	2	x0
P10.7.5	2813	161	1	205	PID1 Low Feedback Protection	BYTE	1	x0
P10.7.6	2814	161	1	206	PID1 High Feedback Level	INTEGER	2	x10
P10.7.7	2815	161	1	207	PID1 High Feedback Time	INTEGER	2	x0
P10.7.8	2816	161	1	208	PID1 High Feedback Protection	BYTE	1	x0
P10.7.9	2817	161	1	209	PID1 Hysteresis Level	INTEGER	2	x10
P10.7.10	2825	161	1	210	PID1 Backup Feedback Source	BYTE	1	x0
P10.8.1	1332	160	1	130	PID1 Feedback 1 Source	BYTE	1	x0
P10.8.2	1333	160	1	131	PID1 Feedback 1 Min	INTEGER	2	x100
P10.8.3	1334	160	1	132	PID1 Feedback 1 Max	INTEGER	2	x100
P10.8.4	1335	160	1	133	PID1 Feedback 2 Source	BYTE	1	x0
P10.8.5	1336	160	1	134	PID1 Feedback 2 Min	INTEGER	2	x100
P10.8.6	1337	160	1	135	PID1 Feedback 2 Max	INTEGER	2	x100
P10.9.1	1338	160	1	136	PID1 Feedforward Func	BYTE	1	x0
P10.9.2	1339	160	1	137	PID1 Feedforward Gain	INTEGER	2	x10
P10.9.3	1340	160	1	138	PID1 Feedforward 1 Source	BYTE	1	x0
P10.9.4	1341	160	1	139	PID1 Feedforward 1 Min	INTEGER	2	x100
P10.9.5	1342	160	1	140	PID1 Feedforward 1 Max	INTEGER	2	x100
P10.9.6	1343	160	1	141	PID1 Feedforward 2 Source	BYTE	1	x0
P10.9.7	1344	160	1	142	PID1 Feedforward 2 Min	INTEGER	2	x100
P10.9.8	1345	160	1	143	PID1 Feedforward 2 Max	INTEGER	2	x100
P11.1.1	553	160	1	32	PID2 Control Enable	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
P11.1.2	352	160	1	41	PID2 Set Point Select	BYTE	1	x0
P11.2.1	1356	160	1	152	PID2 Control Gain	INTEGER	2	x100
P11.2.2	1357	160	1	153	PID2 Control I Time	INTEGER	2	x100
P11.2.3	1358	160	1	154	PID2 Control D Time	INTEGER	2	x100
P11.2.4	1359	160	1	155	PID2 Process Unit	BYTE	1	x0
P11.2.5	1360	160	1	157	PID2 Process Unit Min	DOUBLE	4	x100
P11.2.6	1362	160	1	158	PID2 Process Unit Max	DOUBLE	4	x100
P11.2.7	1364	160	1	156	PID2 Process Unit Decimal	BYTE	1	x0
P11.2.8	1365	160	1	159	PID2 Error Inversion	BYTE	1	x0
P11.2.9	1366	160	1	160	PID2 Dead Band	DOUBLE	4	x100
P11.2.10	1368	160	1	161	PID2 Dead Band Delay	INTEGER	2	x100
P11.2.11	1373	160	1	162	PID2 Ramp Time	INTEGER	2	x100
P11.2.12	4015	161	1	211	PID2 Output Min	INTEGER	2	x100
P11.2.13	4016	161	1	212	PID2 Output Max	INTEGER	2	x100
P11.3.1	1369	162	1	207	PID2 Keypad Set Point 1	DOUBLE	4	x100
P11.3.2	1371	162	1	208	PID2 Keypad Set Point 2	DOUBLE	4	x100
P11.3.3	2467	161	1	153	PID2 Wake Up Action	BYTE	1	x0
P11.3.4	2662	NA	NA	NA	PID2 Sleep Boost level	INTEGER	2	x0
P11.3.5	2663	NA	NA	NA	PID2 Sleep Boost Max Time	INTEGER	2	x0
P11.4.1	1374	160	1	163	PID2 Set Point 1 Source	BYTE	1	x0
P11.4.2	1377	160	1	166	PID2 Set Point 1 Sleep Enable	BYTE	1	x0
P11.4.3	1379	160	1	167	PID2 Set Point 1 Sleep Delay	INTEGER	2	x0
P11.4.4	1380	160	1	168	PID2 Set Point 1 WakeUp Level	DOUBLE	4	x100
P11.4.5	1382	160	1	169	PID2 Set Point 1 Boost	BYTE	1	x10
P11.4.6	2454	161	1	150	PID2 Set Point 1 Sleep Level	DOUBLE	4	x100
P11.4.9	1375	160	1	164	PID2 Set Point 1 Min	INTEGER	2	x100
P11.4.10	1376	160	1	165	PID2 Set Point 1 Max	INTEGER	2	x100
P11.4.11	2398	161	1	149	PID2 Set Point 1 Sleep Unit Sel	BYTE	1	x0
P11.4.12	1416	160	1	199	PID2 Set Point 2 Comp Enable	BYTE	1	x0
P11.4.13	1417	160	1	200	PID2 Set Point 2 Comp Max	INTEGER	2	x100
P11.5.1	1383	160	1	170	PID2 Set Point 2 Source	BYTE	1	x0
P11.5.2	1386	160	1	173	PID2 Set Point 2 Sleep Enable	BYTE	1	x0
P11.5.3	1388	160	1	174	PID2 Set Point 2 Sleep Delay	INTEGER	2	x0
P11.5.4	1389	160	1	175	PID2 Set Point 2 WakeUp Level	DOUBLE	4	x100
P11.5.5	1391	160	1	176	PID2 Set Point 2 Boost	BYTE	1	x10
P11.5.6	2456	161	1	152	PID2 Set Point 2 Sleep Level	DOUBLE	4	x100
P11.5.9	1384	160	1	171	PID2 Set Point 2 Min	INTEGER	2	x100
P11.5.10	1385	160	1	172	PID2 Set Point 2 Max	INTEGER	2	x100
P11.5.11	2399	161	1	151	PID2 Set Point 2 Sleep Unit Sel	BYTE	1	x0
P11.5.12	1414	160	1	197	PID2 Set Point1 Comp Enable	BYTE	1	x0
P11.5.13	1415	160	1	198	PID2 Set Point1 Comp Max	INTEGER	2	x100
P11.6.1	2546	161	1	154	FB PID2 Set Point 1	DOUBLE	4	x100
P11.6.2	2548	161	1	155	FB PID2 Set Point 2	DOUBLE	4	x100
P11.6.3	2552	161	1	156	FB PID2 Feedback 1	INTEGER	2	x100
P11.6.4	2553	161	1	157	FB PID2 Feedback 2	INTEGER	2	x100
P11.6.5	2556	161	1	158	FB PID2 Feedforward 1	INTEGER	2	x100
P11.6.6	2557	161	1	159	FB PID2 Feedforward 2	INTEGER	2	x100
P11.7.1	1393	160	1	178	PID2 Feedback Gain	INTEGER	2	x10
P11.7.2	1392	160	1	177	PID2 Feedback Func	BYTE	1	x0
P11.7.3	2818	161	1	213	PID2 Low Feedback Level	INTEGER	2	x10

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
P11.7.4	2819	161	1	214	PID2 Low Feedback Time	INTEGER	2	x0
P11.7.5	2820	161	1	215	PID2 Low Feedback Protection	BYTE	1	x0
P11.7.6	2821	161	1	216	PID2 High Feedback Level	INTEGER	2	x10
P11.7.7	2822	161	1	217	PID2 High Feedback Time	INTEGER	2	x0
P11.7.8	2823	161	1	218	PID2 High Feedback Protection	BYTE	1	x0
P11.7.9	2824	161	1	219	PID2 Hysteresis Level	INTEGER	2	x10
P11.7.10	2826	NA	NA	NA	PID2 Backup Feedback Source	BYTE	1	x0
P11.8.1	1394	160	1	179	PID2 Feedback 1 Source	BYTE	1	x0
P11.8.2	1395	160	1	180	PID2 Feedback 1 Min	INTEGER	2	x100
P11.8.3	1396	160	1	181	PID2 Feedback 1 Max	INTEGER	2	x100
P11.8.4	1397	160	1	182	PID2 Feedback 2 Source	BYTE	1	x0
P11.8.5	1398	160	1	183	PID2 Feedback 2 Min	INTEGER	2	x100
P11.8.6	1399	160	1	184	PID2 Feedback 2 Max	INTEGER	2	x100
P11.9.1	1400	160	1	185	PID2 Feedforward Func	BYTE	1	x0
P11.9.2	1401	160	1	186	PID2 Feedforward Gain	INTEGER	2	x10
P11.9.3	1402	160	1	187	PID2 Feedforward 1 Source	BYTE	1	x0
P11.9.4	1403	160	1	188	PID2 Feedforward 1 Min	INTEGER	2	x100
P11.9.5	1404	160	1	189	PID2 Feedforward 1 Max	INTEGER	2	x100
P11.9.6	1405	160	1	190	PID2 Feedforward 2 Source	BYTE	1	x0
P11.9.7	1406	160	1	191	PID2 Feedforward 2 Min	INTEGER	2	x100
P11.9.8	1407	160	1	192	PID2 Feedforward 2 Max	INTEGER	2	x100
P14.1	3506	161	1	220	Master Follower Mode	BYTE	1	x0
P14.2	3510	161	1	221	Synchronization Mode	BYTE	1	x0
P14.3	3511	161	1	222	Communication Link	BYTE	1	x0
P14.4	3509	161	1	223	Speed Ratio Refresh Mode	BYTE	1	x0
P14.5	3513	161	1	224	Speed Ratio Refresh Source	BYTE	1	x0
P14.6	3514	161	1	225	Speed Error Response	BYTE	1	x0
P14.7	3512	161	1	226	Speed Error Limit	INTEGER	2	x10
P14.8	3515	161	1	227	Speed Fault Delay	INTEGER	2	x10
P14.9	3516	161	1	228	Torque Ratio	INTEGER	2	x1000
P14.10	3517	161	1	229	Follower Incoming Reference	BYTE	1	x0
P14.11	3518	161	1	230	Follower Start Delay	INTEGER	2	x10
P14.12	3519	161	1	231	Follower Stop Delay	INTEGER	2	x10
P14.13	3520	161	1	232	Master Outgoing Reference	BYTE	1	x0
P14.14	3521	161	1	233	M/F COMM T-OUT	INTEGER	2	x0
P14.15	3522	161	1	234	M/F COMM Fault Response	BYTE	1	x0
P14.16	3523	161	1	235	Follower Error Response	BYTE	1	x0
P14.17	3524	161	1	236	Supervision Response	BYTE	1	x0
P14.18	3525	161	1	237	Limit Reached Response	BYTE	1	x0
P14.19	3526	161	1	238	Follower Stop Mode	BYTE	1	x0
P14.20	3536	161	1	239	Speed Ratio		4	x0
P14.21	3538	161	1	240	Speed Multiplier	INTEGER	2	x1000
P14.22	3539	161	1	241	Speed Ratio Ramp Time	DOUBLE	4	x0
P15.1	199	162	1	224	Jog Enable	BYTE	1	x0
P15.2	3527	161	1	242	Jog Direction	BYTE	1	x0
P15.3	3528	161	1	243	Jog 1 Start Source	BYTE	1	x0
P15.4	3958	161	1	172	Jog1/Inch1 Ref	DOUBLE	4	x100
P15.5	3530	161	1	244	Jog1/Inch1 Acc time	INTEGER	2	x10
P15.6	3531	161	1	245	Jog1/Inch1 Dec time	INTEGER	2	x10
P15.7	3532	161	1	246	Jog 2 Start Source	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
P15.8	3960	161	1	173	Jog2/Inch2 Ref	DOUBLE	4	x100
P15.9	3534	161	1	247	Jog2/Inch2 Acc time	INTEGER	2	x10
P15.10	3535	161	1	248	Jog2/Inch2 Dec time	INTEGER	2	x10
P16.1	3768	161	1	249	Inch Enable	BYTE	1	x0
P16.2	3769	161	1	250	Inch Direction	BYTE	1	x0
P16.3	3770	162	1	1	Inch 1 Start Source	BYTE	1	x0
P16.4	3771	162	1	2	Inch 2 Start Source	BYTE	1	x0
P22.1.1	218	NA	NA	NA	Force Bypass	BYTE	1	x0
P22.1.2	1246	NA	NA	NA	Bypass Overload	BYTE	1	x0
P22.1.3	1418	NA	NA	NA	Bypass Enable	BYTE	1	x0
P22.1.4	544	NA	NA	NA	Bypass Start Delay	INTEGER	2	x0
P22.2.1	542	NA	NA	NA	Auto Bypass	BYTE	1	x0
P22.2.2	543	NA	NA	NA	Auto Bypass Delay	INTEGER	2	x0
P22.2.3	547	NA	NA	NA	OverCurrent Bypass Enable	BYTE	1	x0
P22.2.4	546	NA	NA	NA	IGBT Fault Bypas Enable	BYTE	1	x0
P22.2.5	548	NA	NA	NA	4mA Fault Bypass Enable	BYTE	1	x0
P22.2.6	545	NA	NA	NA	UnderVoltage Bypass Enable	BYTE	1	x0
P22.2.7	549	NA	NA	NA	OverVoltage Bypass Enable	BYTE	1	x0
P22.2.8	1698	NA	NA	NA	Motor OverTemp Bypass Enable	BYTE	1	x0
P22.2.9	1699	NA	NA	NA	UnderLoad Bypass Enable	BYTE	1	x0
P22.2.10	1700	NA	NA	NA	External Bypass Enable	BYTE	1	x0
P22.2.11	1701	NA	NA	NA	Charge Switch Fault Bypass Enable	BYTE	1	x0
P22.2.12	1702	NA	NA	NA	Saturation Trip Fault Bypass Enable	BYTE	1	x0
P22.2.13	1703	NA	NA	NA	Under Temp Fault Bypass Enable	BYTE	1	x0
P22.2.14	1704	NA	NA	NA	EEPROM Fault Bypass Enable	BYTE	1	x0
P22.2.15	1705	NA	NA	NA	Control Board EEPROM Fault Bypass Enable	BYTE	1	x0
P22.2.16	1706	NA	NA	NA	Watchdog Fault Bypass Enable	BYTE	1	x0
P22.2.17	1707	NA	NA	NA	Fan Cooling Fault Bypass Enable	BYTE	1	x0
P22.2.18	1708	NA	NA	NA	Keypad Com Fault Bypass Enable	BYTE	1	x0
P22.2.19	1709	NA	NA	NA	Option Card Fault Bypass Enable	BYTE	1	x0
P22.2.20	1710	NA	NA	NA	RTC Clock Fault Bypass Enable	BYTE	1	x0
P22.2.21	1711	NA	NA	NA	Ctrl Board OverTemp Fault Bypass Enable	BYTE	1	x0
P22.2.22	1713	NA	NA	NA	Fieldbus Fault Bypass Enable	BYTE	1	x0
P22.2.23	2832	NA	NA	NA	Op Cont Interlock Fault Bypass Enable	BYTE	1	x0
P23.1.2	251	NA	NA	NA	Brake Chopper Mode	BYTE	1	x0
P23.1.3	646	NA	NA	NA	Brake Chopper Status	BYTE	1	x0
P23.1.4	647	NA	NA	NA	Brake Resistor Status	BYTE	1	x0
P23.1.5	254	NA	NA	NA	DC-Brake Current	INTEGER	2	x10
P23.1.6	263	NA	NA	NA	Start DC-Brake Time	INTEGER	2	x100
P23.1.7	262	NA	NA	NA	Stop DC-Brake Frequency	INTEGER	2	x100
P23.1.8	255	NA	NA	NA	Stop DC-Brake Time	INTEGER	2	x100
P23.1.9	266	NA	NA	NA	Flux Brake	BYTE	1	x0
P23.1.10	265	NA	NA	NA	Flux Brake Current	INTEGER	2	x10
P23.2.1	202	NA	NA	NA	DC Brake Active	BYTE	1	x0
P24.1	163	160	1	54	Ext Brake Off Delay	INTEGER	2	x10
P24.2	164	160	1	55	Ext Brake On Delay	INTEGER	2	x10
P25.1.1	193	160	1	30	Ext. Fault 1 NC	BYTE	1	x0
P25.1.2	192	160	1	29	Ext. Fault 1 NO	BYTE	1	x0
P25.1.3	2294	161	1	118	Ext. Fault 2 NC	BYTE	1	x0
P25.1.4	2293	161	1	117	Ext. Fault 2 NO	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
P25.1.5	2296	161	1	120	Ext. Fault 3 NC	BYTE	1	x0
P25.1.6	2295	161	1	119	Ext. Fault 3 NO	BYTE	1	x0
P25.2.1	2297	NA	NA	NA	Ext. Fault 1 Text	BYTE	1	x0
P25.2.2	2298	NA	NA	NA	Ext. Fault 2 Text	BYTE	1	x0
P25.2.3	2299	NA	NA	NA	Ext. Fault 3 Text	BYTE	1	x0
P26.1.1	750	160	1	237	Line Start Lockout	BYTE	1	x0
P26.1.2	332	160	1	87	Input Phase Fault	BYTE	1	x0
P26.1.3	306	160	1	72	4mA Input Fault	BYTE	1	x0
P26.1.4	331	160	1	73	4mA Fault Frequency	INTEGER	2	x100
P26.1.5	307	160	1	86	External Fault	BYTE	1	x0
P26.1.6	2666	162	1	3	Under Voltage Trip Level	INTEGER	2	x0
P26.1.7	330	160	1	90	Uvolt Fault Response	BYTE	1	x0
P26.1.8	1564	161	1	50	Unit Under Temp Prot	BYTE	1	x0
P26.1.9	2427	161	1	137	Safe Torque Off Response	BYTE	1	x0
P26.1.12	2130	161	1	98	Under Temp Fault Override	BYTE	1	x0
P26.1.13	955	160	1	91	RTC Fault	BYTE	1	x0
P26.1.14	337	160	1	92	PT100 Fault Response	BYTE	1	x0
P26.1.15	1256	160	1	242	Replace Battery Fault Response	BYTE	1	x0
P26.1.16	1257	160	1	243	Replace Fan Fault Response	BYTE	1	x0
P26.1.17	2163	161	1	99	Preheat Output Volt	BYTE	1	x10
P26.1.18	2657	NA	NA	NA	Warning Operation Mode	BYTE	1	x0
P26.1.19	2664	NA	NA	NA	Fan Protection	BYTE	1	x0
P26.1.20	4018	NA	NA	NA	AI-Fault Protection	BYTE	1	x0
P26.1.21	3841	NA	NA	NA	AI Fault Frequency	INTEGER	2	x100
P26.1.22	2894	NA	NA	NA	CP Interlock NC	BYTE	1	x0
P26.1.23	2895	NA	NA	NA	CP Interlock Run Protection	BYTE	1	x0
P26.1.24	2896	NA	NA	NA	CP Interlock Stop Protection	BYTE	1	x0
P26.1.25	2897	NA	NA	NA	CP Interlock Attempts	BYTE	1	x0
P26.2.1	308	NA	NA	NA	Output Phase Fault	BYTE	1	x0
P26.2.2	309	NA	NA	NA	Ground Fault	BYTE	1	x0
P26.2.3	2158	NA	NA	NA	Ground Fault Limit	BYTE	1	x0
P26.2.4	310	160	1	82	Motor Thermal Protection	BYTE	1	x0
P26.2.5	311	160	1	83	Motor Thermal F0 Current	INTEGER	2	x10
P26.2.8	333	160	1	89	Thermistor Fault Response	BYTE	1	x0
P26.2.9	313	160	1	74	Stall Protection	BYTE	1	x0
P26.2.10	314	160	1	75	Stall Current Limit	INTEGER	2	x10
P26.2.11	315	160	1	76	Stall Time Limit	INTEGER	2	x10
P26.2.12	316	160	1	77	Stall Frequency Limit	INTEGER	2	x100
P26.2.13	317	160	1	78	Underload Protection	BYTE	1	x0
P26.2.14	318	160	1	79	Underload Fnom Torque	INTEGER	2	x10
P26.2.15	319	160	1	80	Underload F0 Torque	INTEGER	2	x10
P26.2.16	320	160	1	81	Underload Time Limit	INTEGER	2	x100
P26.2.17	3965	NA	NA	NA	Thermistor Check Enable	BYTE	1	x0
P26.3.1	334	162	1	250	Fieldbus Fault Response	BYTE	1	x0
P26.3.2	335	160	1	85	OPTCard Fault Response	BYTE	1	x0
P26.3.3	1678	161	1	49	IP Address Confliction Resp	BYTE	1	x0
P26.3.4	4017	NA	NA	NA	Card Plug Slot Error Fault Protection	BYTE	1	x0
P26.10.1	2405	161	1	136	PID Feedback AI Loss Attempts	BYTE	1	x0
P26.10.2	2401	161	1	132	PID Feedback AI Loss Response	BYTE	1	x0
P26.10.3	2402	161	1	133	PID Feedback AI Loss Pre Freq	INTEGER	2	x100

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
P26.10.4	2403	161	1	134	PID Feedback AI Loss Pipe Fill Loss Level	INTEGER	2	x10
P26.10.5	2404	161	1	135	PID Feedback AI Loss PreFreq Timeout	INTEGER	2	x0
P26.12.1	3281	162	1	4	PID2 Feedback AI Loss Attempts	BYTE	1	x0
P26.12.2	3277	162	1	5	PID2 Feedback AI Loss Response	BYTE	1	x0
P26.12.3	3278	162	1	6	PID2 Feedback AI Loss Pre Freq	INTEGER	2	x100
P26.12.4	3279	162	1	7	PID2 Feedback AI Loss Pipe Fill Loss Level	INTEGER	2	x10
P26.12.5	3280	162	1	8	PID2 Feedback AI Loss PreFreq Timeout	INTEGER	2	x0
P26.20.1	2428	161	1	162	Prime Pump Enable	BYTE	1	x0
P26.20.2	2429	161	1	163	Prime Pump Level	DOUBLE	4	x100
P26.20.3	2431	162	1	202	Prime Pump Frequency	INTEGER	2	x100
P26.20.4	2432	161	1	164	Prime Pump Delay Time	INTEGER	2	x10
P26.20.5	2433	161	1	165	Prime Pump Loss Of Prime Level	INTEGER	2	x10
P26.20.6	2434	161	1	166	Prime Pump Level 2	DOUBLE	4	x100
P26.20.7	2436	162	1	203	Prime Pump Frequency 2	INTEGER	2	x100
P26.20.8	2437	161	1	167	Prime Pump Delay Time 2	INTEGER	2	x10
P26.20.9	2438	161	1	168	Prime Pump Loss Of Prime Level 2	INTEGER	2	x10
P26.21.1	2410	161	1	161	Pipe Fill Loss Response	BYTE	1	x0
P26.21.2	2406	161	1	160	Pipe Fill Loss Detection Method	BYTE	1	x0
P26.21.4	2409	NA	NA	NA	Pipe Fill Loss Frequency	INTEGER	2	x100
P26.21.7	2408	NA	NA	NA	Pipe Fill Loss Time	INTEGER	2	x0
P26.21.8	2411	NA	NA	NA	Pipe Fill Loss Attempts	BYTE	1	x0
P27.1.1	170	NA	NA	NA	AI Supv Select	BYTE	1	x0
P27.1.2	171	NA	NA	NA	AI Limit Supv	BYTE	1	x0
P27.1.4	172	NA	NA	NA	AI Limit Supv Val	INTEGER	2	x100
P27.1.5	2198	NA	NA	NA	AI Supv Hyst	INTEGER	2	x100
P27.1.6	2193	NA	NA	NA	Second AI Supv Select	BYTE	1	x0
P27.1.7	2194	NA	NA	NA	Second AI Limit Supv	BYTE	1	x0
P27.1.9	2195	NA	NA	NA	Second AI Limit Supv Val	INTEGER	2	x100
P27.1.10	2199	NA	NA	NA	Second AI Supv Hyst	INTEGER	2	x100
P27.7.1	165	NA	NA	NA	Temp Limit Supv	BYTE	1	x0
P27.7.3	166	NA	NA	NA	Temp Limit Supv Val	INTEGER	2	x10
P27.7.4	2204	NA	NA	NA	Temp Limit Supv Hyst	INTEGER	2	x10
P27.8.1	167	NA	NA	NA	Power Limit Supv	BYTE	1	x0
P27.8.3	168	NA	NA	NA	Power Limit Supv Val	INTEGER	2	x10
P27.8.4	2205	NA	NA	NA	Power Limit Supv Hyst	INTEGER	2	x10
P27.8.5	159	NA	NA	NA	Torque Limit Supv	BYTE	1	x0
P27.8.7	160	NA	NA	NA	Torque Limit Supv Val	INTEGER	2	x10
P27.8.8	2202	NA	NA	NA	Torque Limit Supv Hyst	INTEGER	2	x10
P27.8.9	2189	NA	NA	NA	Motor Current 1 Supv	BYTE	1	x0
P27.8.11	2190	162	1	200	Motor Current 1 Supv Value	INTEGER	2	x10
P27.8.12	2196	161	1	126	Motor Current 1 Supv Hyst	BYTE	1	x10
P27.8.13	2191	161	1	125	Motor Current 2 Supv	BYTE	1	x0
P27.8.15	2192	162	1	201	Motor Current 2 Supv Value	INTEGER	2	x10
P27.8.16	2197	161	1	127	Motor Current 2 Supv Hyst	BYTE	1	x10
P27.8.17	154	160	1	48	Freq Limit 1 Supv	BYTE	1	x0
P27.8.19	155	160	1	49	Freq Limit 1 Supv Val	INTEGER	2	x100
P27.8.20	2200	161	1	128	Freq Limit 1 Supv Hyst	INTEGER	2	x100
P27.8.21	157	160	1	50	Freq Limit 2 Supv	BYTE	1	x0
P27.8.23	158	160	1	51	Freq Limit 2 Supv Val	INTEGER	2	x100
P27.8.24	2201	161	1	129	Freq Limit 2 Supv Hyst	INTEGER	2	x100

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
P27.8.25	161	160	1	52	Ref Limit Supv	BYTE	1	x0
P27.8.27	162	160	1	53	Ref Limit Supv Val	INTEGER	2	x100
P27.8.28	2203	161	1	130	Ref Limit Supv Hyst	INTEGER	2	x100
P27.8.29	3772	NA	NA	NA	Speed Limit Supervision	BYTE	1	x0
P27.8.30	3773	NA	NA	NA	Speed Limit Supervised Value	INTEGER	2	x0
P27.8.31	3774	NA	NA	NA	Speed Limit Supervised Hysteresis	INTEGER	2	x0
P27.10.1	1346	160	1	144	PID1 Superv Enable	BYTE	1	x0
P27.10.3	1347	160	1	145	PID1 Superv Upper Limit	DOUBLE	4	x100
P27.10.4	1349	160	1	146	PID1 Superv Lower Limit	DOUBLE	4	x100
P27.10.5	1351	160	1	147	PID1 Superv Delay	INTEGER	2	x0
P27.11.1	1408	160	1	193	PID2 Superv Enable	BYTE	1	x0
P27.11.3	1409	160	1	194	PID2 Superv Upper Limit	DOUBLE	4	x100
P27.11.4	1411	160	1	195	PID2 Superv Lower Limit	DOUBLE	4	x100
P27.11.5	1413	160	1	196	PID2 Superv Delay	INTEGER	2	x0
P30.1.1	224	NA	NA	NA	Start Timer 1	BYTE	1	x0
P30.1.2	225	NA	NA	NA	Start Timer 2	BYTE	1	x0
P30.1.3	226	NA	NA	NA	Start Timer 3	BYTE	1	x0
P30.2.1	558	NA	NA	NA	TC1, TC2, TC3	BYTE	1	x0
P30.2.2	569	NA	NA	NA	Timer 1	DOUBLE	4	x0
P30.2.3	571	NA	NA	NA	Timer 2	DOUBLE	4	x0
P30.2.4	573	NA	NA	NA	Timer 3	DOUBLE	4	x0
P30.2.5	511	NA	NA	NA	Timer 1 Duration	DOUBLE	4	x0
P30.2.6	532	NA	NA	NA	Timer 1 Channel	BYTE	1	x0
P30.2.7	513	NA	NA	NA	Timer 2 Duration	DOUBLE	4	x0
P30.2.8	533	NA	NA	NA	Timer 2 Channel	BYTE	1	x0
P30.2.9	515	NA	NA	NA	Timer 3 Duration	DOUBLE	4	x0
P30.2.10	534	NA	NA	NA	Timer 3 Channel	BYTE	1	x0
P30.3.1	559	NA	NA	NA	Interval 1	BYTE	1	x0
P30.3.2	560	NA	NA	NA	Interval 2	BYTE	1	x0
P30.3.3	561	NA	NA	NA	Interval 3	BYTE	1	x0
P30.3.4	562	NA	NA	NA	Interval 4	BYTE	1	x0
P30.3.5	563	NA	NA	NA	Interval 5	BYTE	1	x0
P30.4.1	2487	NA	NA	NA	Interval 1 Setting	BYTE	1	x0
P30.4.2	2488	NA	NA	NA	Interval 2 Setting	BYTE	1	x0
P30.4.3	2489	NA	NA	NA	Interval 3 Setting	BYTE	1	x0
P30.4.4	2490	NA	NA	NA	Interval 4 Setting	BYTE	1	x0
P30.4.5	2491	NA	NA	NA	Interval 5 Setting	BYTE	1	x0
P30.5.1	491	NA	NA	NA	Interval 1 On Time	BYTE	3	x0
P30.5.2	493	NA	NA	NA	Interval 1 Off Time	BYTE	3	x0
P30.5.3	517	NA	NA	NA	Interval 1 From Day	BYTE	1	x0
P30.5.4	518	NA	NA	NA	Interval 1 To Day	BYTE	1	x0
P30.5.5	519	NA	NA	NA	Interval 1 Channel	BYTE	1	x0
P30.5.6	495	NA	NA	NA	Interval 2 On Time	BYTE	3	x0
P30.5.7	497	NA	NA	NA	Interval 2 Off Time	BYTE	3	x0
P30.5.8	520	NA	NA	NA	Interval 2 From Day	BYTE	1	x0
P30.5.9	521	NA	NA	NA	Interval 2 To Day	BYTE	1	x0
P30.5.10	522	NA	NA	NA	Interval 2 Channel	BYTE	1	x0
P30.5.11	499	NA	NA	NA	Interval 3 On Time	BYTE	3	x0
P30.5.12	501	NA	NA	NA	Interval 3 Off Time	BYTE	3	x0
P30.5.13	523	NA	NA	NA	Interval 3 From Day	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
P30.5.14	524	NA	NA	NA	Interval 3 To Day	BYTE	1	x0
P30.5.15	525	NA	NA	NA	Interval 3 Channel	BYTE	1	x0
P30.5.16	503	NA	NA	NA	Interval 4 On Time	BYTE	3	x0
P30.5.17	505	NA	NA	NA	Interval 4 Off Time	BYTE	3	x0
P30.5.18	526	NA	NA	NA	Interval 4 From Day	BYTE	1	x0
P30.5.19	527	NA	NA	NA	Interval 4 To Day	BYTE	1	x0
P30.5.20	528	NA	NA	NA	Interval 4 Channel	BYTE	1	x0
P30.5.21	507	NA	NA	NA	Interval 5 On Time	BYTE	3	x0
P30.5.22	509	NA	NA	NA	Interval 5 Off Time	BYTE	3	x0
P30.5.23	529	NA	NA	NA	Interval 5 From Day	BYTE	1	x0
P30.5.24	530	NA	NA	NA	Interval 5 To Day	BYTE	1	x0
P30.5.25	531	NA	NA	NA	Interval 5 Channel	BYTE	1	x0
P40.1.1	317	160	1	78	Underload Protection	BYTE	1	x0
P40.1.2	318	160	1	79	Underload Fnom Torque	INTEGER	2	x10
P40.1.3	319	160	1	80	Underload F0 Torque	INTEGER	2	x10
P40.1.4	320	160	1	81	Underload Time Limit	INTEGER	2	x100
P40.2.1	483	NA	NA	NA	Damper Start	BYTE	1	x0
P40.2.2	484	NA	NA	NA	Damper Time Out	INTEGER	2	x0
P40.2.3	485	NA	NA	NA	Damper Delay	INTEGER	2	x0
P41.1.1	1847	NA	NA	NA	Valve Start	BYTE	1	x0
P41.1.2	1848	NA	NA	NA	Valve Time Out	INTEGER	2	x0
P41.1.3	1849	NA	NA	NA	Valve Delay	INTEGER	2	x0
P41.1.4	2423	161	1	115	Run Delay Time	INTEGER	2	x0
P41.1.5	1813	NA	NA	NA	Minimum Run Time	INTEGER	2	x0
P41.2.1	2394	NA	NA	NA	Deragging Enable	BYTE	1	x0
P41.2.2	2468	NA	NA	NA	Derag Cycles	BYTE	1	x0
P41.2.3	2469	NA	NA	NA	Derag At Start/Stop	BYTE	1	x0
P41.2.4	2470	NA	NA	NA	Deragging Run Time	INTEGER	2	x0
P41.2.5	2471	NA	NA	NA	Derag Speed	INTEGER	2	x100
P41.2.6	2472	NA	NA	NA	Derag Off Delay	INTEGER	2	x0
P41.3.1	2279	NA	NA	NA	Multi-pump Mode	BYTE	1	x0
P41.3.2	2659	NA	NA	NA	Multi-pump Mode 2	BYTE	1	x0
P41.3.3	2658	NA	NA	NA	Multi-pump Mode 1/2 Select	BYTE	1	x0
P41.3.4	2449	NA	NA	NA	Number Of Drives	BYTE	1	x0
P41.3.5	2278	NA	NA	NA	Drive ID	BYTE	1	x0
P41.3.6	2458	NA	NA	NA	PID Bandwidth	DOUBLE	4	x100
P41.3.7	2315	NA	NA	NA	Staging Frequency	INTEGER	2	x100
P41.3.8	2316	NA	NA	NA	De-Staging Frequency	INTEGER	2	x100
P41.3.9	344	NA	NA	NA	Add/Remove Delay	INTEGER	2	x0
P41.3.10	350	NA	NA	NA	Interlock Enable	BYTE	1	x0
P41.3.11	2803	NA	NA	NA	OP Cont Interlock Attempts	BYTE	1	x0
P41.3.12	2831	NA	NA	NA	OP Cont Interlock Protection	BYTE	1	x0
P41.3.13	2802	NA	NA	NA	OP Cont Interlock NC	BYTE	1	x0
P41.3.14	2801	NA	NA	NA	OP Cont Interlock NO	BYTE	1	x0
P41.3.15	210	160	1	42	Motor Interlock 1	BYTE	1	x0
P41.3.16	211	NA	NA	NA	Motor Interlock 2	BYTE	1	x0
P41.3.17	212	NA	NA	NA	Motor Interlock 3	BYTE	1	x0
P41.3.18	213	NA	NA	NA	Motor Interlock 4	BYTE	1	x0
P41.3.19	214	NA	NA	NA	Motor Interlock 5	BYTE	1	x0
P41.4.1	2284	NA	NA	NA	Regulation Source	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
P41.4.2	2285	NA	NA	NA	Recovery Method	BYTE	1	x0
P41.4.3	2311	NA	NA	NA	Add/Remove Drive Selection	BYTE	1	x0
P41.4.4	2280	NA	NA	NA	Run Time Enable	BYTE	1	x0
P41.4.5	2281	NA	NA	NA	Run Time Limit	DOUBLE	4	x10
P41.4.6	2283	NA	NA	NA	Run Time Reset	BYTE	1	x0
P41.4.7	2473	NA	NA	NA	Master Drive Mode	BYTE	1	x0
P41.4.8	2474	NA	NA	NA	Master Fixed Speed	INTEGER	2	x100
P41.4.9	2475	NA	NA	NA	Master Fixed Speed Delay	INTEGER	2	x0
P41.5.1	2476	NA	NA	NA	Redundant Drive Enable	BYTE	1	x0
P41.5.2	2477	NA	NA	NA	Redundant Run Time Enable	BYTE	1	x0
P41.5.3	2478	NA	NA	NA	Redundant Run Time Reset	BYTE	1	x0
P41.5.4	2479	NA	NA	NA	Redundant RunTime Limit	DOUBLE	4	x100
P41.6.1	342	NA	NA	NA	Number Of Pumps	BYTE	1	x0
P41.6.2	346	NA	NA	NA	Include Freq Converter	BYTE	1	x0
P41.6.3	345	NA	NA	NA	Auto-Change Enable	BYTE	1	x0
P41.6.4	347	NA	NA	NA	Auto-Change Interval	INTEGER	2	x10
P41.6.5	349	NA	NA	NA	Auto-Change Freq Limit	INTEGER	2	x100
P41.6.6	348	NA	NA	NA	Auto-Change Pump Limit	BYTE	1	x0
P41.7.1	2439	NA	NA	NA	Pipe Fill Aux Pump Select	BYTE	1	x0
P41.7.2	2440	NA	NA	NA	Pipe Fill Aux Pump Run Time	INTEGER	2	x10
P41.7.3	2441	NA	NA	NA	Pipe Fill Aux Pump Operation	BYTE	1	x0
P41.7.4	2442	NA	NA	NA	Pipe Fill Aux Pump Delay	INTEGER	2	x10
P41.7.5	2286	NA	NA	NA	Callback Source	BYTE	1	x0
P41.7.6	2407	NA	NA	NA	Pipe Fill Loss Level	INTEGER	2	x10
P41.8.1	2804	NA	NA	NA	Jockey Pump Enable	BYTE	1	x0
P41.8.2	2805	NA	NA	NA	Jockey Start Level	DOUBLE	4	x100
P41.8.3	2807	NA	NA	NA	Jockey Stop Level	DOUBLE	4	x100
P41.9.1	2809	NA	NA	NA	Lube Pump Enable	BYTE	1	x0
P41.9.2	2810	NA	NA	NA	Lube Pump Time	INTEGER	2	x10
P41.10.1	1853	NA	NA	NA	Broken Pipe Fault Response	BYTE	1	x0
P41.10.2	1854	NA	NA	NA	Broken Pipe Level	INTEGER	2	x10
P41.10.3	1855	NA	NA	NA	Broken Pipe Delay	INTEGER	2	x10
P41.10.4	1856	NA	NA	NA	Broken Pipe Frequency	INTEGER	2	x100
P80.1.1	751	160	1	238	Logic Function Select	BYTE	1	x0
P80.1.2	752	160	1	239	Logic Operation Input A	BYTE	1	x0
P80.1.3	753	160	1	240	Logic Operation Input B	BYTE	1	x0
P81.1	5005	NA	NA	NA	Logic Engine Control	BYTE	1	x0
P81.2	5006	NA	NA	NA	Logic Engine Status	BYTE	1	x0
P95.1.1	627	NA	NA	NA	Multimonitor Set	BYTE	1	x0
P95.1.3	116	NA	NA	NA	Keypad Direction	BYTE	1	x0
P95.1.4	114	NA	NA	NA	Keypad Stop	BYTE	1	x0
P95.1.7	628	NA	NA	NA	Default Page	BYTE	1	x0
P95.1.8	2157	NA	NA	NA	Keypad Comm Fault Response	BYTE	1	x0
P95.1.9	629	NA	NA	NA	Timeout Time	INTEGER	2	x0
P95.1.10	630	NA	NA	NA	Contrast Adjust	BYTE	1	x0
P95.1.11	631	NA	NA	NA	Backlight Time	INTEGER	2	x0
P95.1.12	632	NA	NA	NA	Fan Control	BYTE	1	x0
P95.1.13	633	NA	NA	NA	Keypad ACK Timeout	INTEGER	2	x0
P95.1.14	634	NA	NA	NA	Keypad Retry Number	BYTE	1	x0
P95.1.15	75	NA	NA	NA	Keypad Lock Password	INTEGER	2	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
P95.1.17	2412	NA	NA	NA	Jog Softkey Hidden	BYTE	1	x0
P95.1.18	2413	NA	NA	NA	Reverse Softkey Hidden	BYTE	1	x0
P95.2.1	2424	NA	NA	NA	Output Display Unit	BYTE	1	x0
P95.2.2	2460	NA	NA	NA	Output Display Unit Min	DOUBLE	4	x100
P95.2.3	2425	NA	NA	NA	Output Display Unit Max	DOUBLE	4	x100
P95.3.1	3833	NA	NA	NA	Touch Screen Backlight Time	BYTE	1	x10
P95.3.2	3834	NA	NA	NA	Backlight Brightness	BYTE	1	x0
P96.1.1	2533	161	1	37	FB Process Data Input 1 Sel	INTEGER	2	x0
P96.1.2	2534	161	1	38	FB Process Data Input 2 Sel	INTEGER	2	x0
P96.1.3	2535	161	1	39	FB Process Data Input 3 Sel	INTEGER	2	x0
P96.1.4	2536	161	1	40	FB Process Data Input 4 Sel	INTEGER	2	x0
P96.1.5	2537	161	1	41	FB Process Data Input 5 Sel	INTEGER	2	x0
P96.1.6	2538	161	1	42	FB Process Data Input 6 Sel	INTEGER	2	x0
P96.1.7	2539	161	1	43	FB Process Data Input 7 Sel	INTEGER	2	x0
P96.1.8	2540	161	1	44	FB Process Data Input 8 Sel	INTEGER	2	x0
P96.1.9	3988	161	1	45	FB Process Data Input 9 Sel	INTEGER	2	x0
P96.1.10	3989	161	1	46	FB Process Data Input 10 Sel	INTEGER	2	x0
P96.1.11	3990	161	1	47	FB Process Data Input 11 Sel	INTEGER	2	x0
P96.1.12	3991	161	1	48	FB Process Data Input 12 Sel	INTEGER	2	x0
P96.2.1	1556	161	1	25	FB Process Data Output 1 Sel	INTEGER	2	x0
P96.2.2	1557	161	1	26	FB Process Data Output 2 Sel	INTEGER	2	x0
P96.2.3	1558	161	1	27	FB Process Data Output 3 Sel	INTEGER	2	x0
P96.2.4	1559	161	1	28	FB Process Data Output 4 Sel	INTEGER	2	x0
P96.2.5	1560	161	1	29	FB Process Data Output 5 Sel	INTEGER	2	x0
P96.2.6	1561	161	1	30	FB Process Data Output 6 Sel	INTEGER	2	x0
P96.2.7	1562	161	1	31	FB Process Data Output 7 Sel	INTEGER	2	x0
P96.2.8	1563	161	1	32	FB Process Data Output 8 Sel	INTEGER	2	x0
P96.2.9	3984	161	1	33	FB Process Data Output 9 Sel	INTEGER	2	x0
P96.2.10	3985	161	1	34	FB Process Data Output 10 Sel	INTEGER	2	x0
P96.2.11	3986	161	1	35	FB Process Data Output 11 Sel	INTEGER	2	x0
P96.2.12	3987	161	1	36	FB Process Data Output 12 Sel	INTEGER	2	x0
P96.3.1	2415	161	1	101	Standard Status Word Bit0 Function Select	BYTE	1	x0
P96.3.2	2416	161	1	102	Standard Status Word Bit1 Function Select	BYTE	1	x0
P96.3.3	2417	161	1	103	Standard Status Word Bit2 Function Select	BYTE	1	x0
P96.3.4	2418	161	1	104	Standard Status Word Bit3 Function Select	BYTE	1	x0
P96.3.5	2419	161	1	105	Standard Status Word Bit4 Function Select	BYTE	1	x0
P96.3.6	2420	161	1	106	Standard Status Word Bit5 Function Select	BYTE	1	x0
P96.3.7	2421	161	1	107	Standard Status Word Bit6 Function Select	BYTE	1	x0
P96.3.8	2422	161	1	108	Standard Status Word Bit7 Function Select	BYTE	1	x0
P96.4.1	586	NA	NA	NA	RS485 Comm Set	BYTE	1	x0
P96.4.2	588	NA	NA	NA	Modbus RTU Protocol Status	BYTE	1	x0
P96.4.3	3969	NA	NA	NA	RS485 Terminal Resistance Connect	BYTE	1	x0
P96.5.1	1500	160	1	222	IP Address Mode	BYTE	1	x0
P96.5.2	1507	160	1	226	Active IP Address	BYTE	4	x0
P96.5.3	1509	160	1	227	Active Subnet Mask	BYTE	4	x0
P96.5.4	1511	160	1	228	Active Default Gateway	BYTE	4	x0
P96.5.5	1513	NA	NA	NA	MAC Address	BYTE	6	x0
P96.5.6	1501	160	1	223	Static IP Address	BYTE	4	x0
P96.5.7	1503	160	1	224	Static Subnet Mask	BYTE	4	x0
P96.5.8	1505	160	1	225	Static Default Gateway	BYTE	4	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
P96.6.1	2921	NA	NA	NA	WebUI Enable	BYTE	1	x0
P96.6.2	68	NA	NA	NA	Trusted IP White List	BYTE	12	x0
P96.6.3	1894	NA	NA	NA	Web Service Enable	BYTE	1	x0
P96.6.4	74	NA	NA	NA	Modbus TCP Trusted IP Enable	BYTE	1	x0
P96.6.5	1942	NA	NA	NA	Modbus TCP Enable	BYTE	1	x0
P96.7.1	1895	NA	NA	NA	Bluetooth Enable	BYTE	1	x0
P96.7.2	2920	NA	NA	NA	Bluetooth Broadcast Mode	BYTE	1	x0
P96.7.3	2935	NA	NA	NA	Bluetooth Pairing Reset	BYTE	1	x0
P96.7.4	3974	NA	NA	NA	Bluetooth Connect Status	BYTE	1	x0
P96.8.1	3001	NA	NA	NA	IOT Enable	BYTE	1	x0
P96.8.2	3002	NA	NA	NA	IOT Connection Status	BYTE	1	x0
P96.8.3	3188	NA	NA	NA	SNTP Server Status	BYTE	1	x0
P96.8.4	3003	NA	NA	NA	Proxy Enable	BYTE	1	x0
P96.8.5	3178	NA	NA	NA	SNTP Enable	BYTE	1	x0
P96.8.6	3179	NA	NA	NA	SNTP Server 1	BYTE	4	x0
P96.8.7	3181	NA	NA	NA	SNTP Server 2	BYTE	4	x0
P96.8.8	3183	NA	NA	NA	SNTP Server 3	BYTE	4	x0
P96.8.9	3185	NA	NA	NA	Sntp Update Time	DOUBLE	4	x0
P96.8.10	3187	NA	NA	NA	Sntp Retry Time	INTEGER	2	x0
P96.9.1	584	NA	NA	NA	Baud Rate	BYTE	1	x0
P96.9.2	585	NA	NA	NA	Parity Type And Stop Bit	BYTE	1	x0
P96.9.3	593	NA	NA	NA	Comm Timeout Modbus RTU	INTEGER	2	x0
P96.9.4	587	NA	NA	NA	Slave Address	BYTE	1	x0
P96.9.5	2516	NA	NA	NA	Modbus RTU Fault Response	BYTE	1	x0
P96.13.1	609	NA	NA	NA	Connection Limit	BYTE	1	x0
P96.13.2	610	NA	NA	NA	Modbus TCP Unit ID	BYTE	1	x0
P96.13.3	611	NA	NA	NA	Comm Timeout Modbus TCP	INTEGER	2	x0
P96.13.4	612	NA	NA	NA	Modbus TCP Protocol Status	BYTE	1	x0
P96.13.5	2517	NA	NA	NA	Modbus TCP Fault Response	BYTE	1	x0
P96.13.6	3978	NA	NA	NA	TCP Fieldbus Fault Response	BYTE	1	x0
P96.16.1	2915	NA	NA	NA	WebUI Protocol Status	BYTE	1	x0
P96.16.2	2916	NA	NA	NA	WebUI Fault Response	BYTE	1	x0
P96.16.3	2919	NA	NA	NA	WebUI Communication Timeout	INTEGER	2	x0
P96.16.4	3979	NA	NA	NA	WebUI Fieldbus Fault Response	BYTE	1	x0
P98.1	3801	NA	NA	NA	User Access Level	BYTE	1	x0
P98.2	3802	NA	NA	NA	Operator Level Password		16	x0
P98.3	3810	NA	NA	NA	Installer Level Password		16	x0
P98.5	3826	NA	NA	NA	User Access Level Password Timeout	BYTE	1	x0
P98.6	3827	NA	NA	NA	User Access Level Logout	BYTE	1	x0
P99.1.1	340	NA	NA	NA	Language	BYTE	1	x0
P99.1.3	624	NA	NA	NA	Password	INTEGER	2	x0
P99.1.4	625	NA	NA	NA	Parameter Lock	BYTE	1	x0
P99.1.5	626	NA	NA	NA	Startup Wizard	BYTE	1	x0
P99.2.1	2312	161	1	121	Parameter Set1/2 Sel	BYTE	1	x0
P99.2.2	215	160	1	35	No Access To Param	BYTE	1	x0
P99.2.3	619	161	1	174	Parameter Sets	INTEGER	2	x0
P99.2.4	620	160	1	234	Up To Keypad	BYTE	1	x0
P99.2.5	621	160	1	235	Down From Keypad	BYTE	1	x0
P99.2.6	623	160	1	236	Parameter Comparison	BYTE	1	x0
P99.3.1	566	162	1	204	Real Time Clock	BYTE	6	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
P99.3.2	582	162	1	205	Daylight Saving	BYTE	1	x0
P99.3.3	583	162	1	206	RTC Battery Status	BYTE	1	x0
P99.3.4	5581	NA	NA	NA	Drive Time Offset	BYTE	1	x0
P99.4.1	640	NA	NA	NA	Keypad Software Version	INTEGER	4	x0
P99.4.2	642	NA	NA	NA	Motor Control Software Version	INTEGER	4	x0
P99.4.3	644	1	1	4	Application Software Version	INTEGER	4	x0
P99.4.4	1714	NA	NA	NA	Software Bundle Version		20	x0
P99.4.5	5584	NA	NA	NA	Diagnostic Software Version	INTEGER	4	x0
P99.5.1	648	1	1	6	Serial Number	DOUBLE	4	x0
P99.5.2	1270	NA	NA	NA	Power Unit Serial Number	DOUBLE	4	x0
P99.5.3	1276	NA	NA	NA	Control Unit Serial Number	DOUBLE	4	x0
P99.6.1	2122	NA	NA	NA	Currency	BYTE	1	x0
P99.6.2	2123	NA	NA	NA	Energy Cost	INTEGER	2	x100
P99.6.3	2124	NA	NA	NA	Data Type	BYTE	1	x0
P99.6.4	2125	NA	NA	NA	Energy Savings Reset	BYTE	1	x0
P99.7.1	3832	NA	NA	NA	SD Card Copy Operation	BYTE	1	x0
P99.7.2	3911	NA	NA	NA	SD Card Download Operation	BYTE	1	x0
P99.7.3	3966	NA	NA	NA	SD Card Firmware Upgrade Select	BYTE	1	x0
P99.7.4	5587	NA	NA	NA	SD Upgrade language 1 selection	BYTE	1	x0
P99.7.5	5588	NA	NA	NA	SD Upgrade language 2 selection	BYTE	1	x0
P99.8.1	635	NA	NA	NA	Clear Trip MWh Count	BYTE	1	x0
P99.8.2	639	NA	NA	NA	Clear Trip Power Count	BYTE	1	x0
B2.1.1	883	162	1	26	Board Status	BYTE	1	x0
B2.1.2	1064	162	1	29	Slot A: FW Version	INTEGER	4	x0
B2.1.3	889	162	1	30	DI101-103 Status (3DI/3DO/1Th)	BYTE	1	x0
B2.1.4	888	162	1	31	DO101-103 Status (3DI/3DO/1Th)	BYTE	1	x0
B2.1.5	891	162	1	32	Thermistor101 Resistance	DOUBLE	4	x0
B2.1.6	887	162	1	33	Thermistor101 State	BYTE	1	x0
B2.2.1	241	162	1	34	DO101 Function	BYTE	1	x0
B2.2.2	242	162	1	35	DO102 Function	BYTE	1	x0
B2.2.3	243	162	1	36	DO103 Function	BYTE	1	x0
B2.2.4	890	162	1	37	Thermistor101 Mode	BYTE	1	x0
B3.1.1	883	162	1	26	Board Status	BYTE	1	x0
B3.1.2	1064	162	1	29	Slot A: FW Version	INTEGER	4	x0
B3.1.3	894	162	1	61	AI101 (1AI/2AO)	INTEGER	2	x1000
B3.1.4	897	162	1	62	AO101 (1AI/2AO)	INTEGER	2	x1000
B3.1.5	899	162	1	63	AO102 (1AI/2AO)	INTEGER	2	x1000
B3.2.1	893	162	1	244	AI101 Mode	BYTE	1	x0
B3.2.2	124	162	1	49	AI101 Signal Range	BYTE	1	x0
B3.2.3	125	162	1	50	AI101 Custom Min	INTEGER	2	x100
B3.2.4	126	162	1	51	AI101 Custom Max	INTEGER	2	x100
B3.2.5	123	162	1	52	AI101 Filter Time	INTEGER	2	x100
B3.2.6	127	162	1	53	AI101 Signal Invert	BYTE	1	x0
B3.2.7	896	162	1	54	AO101 Mode	BYTE	1	x0
B3.2.8	235	162	1	55	AO101 Function	BYTE	1	x0
B3.2.9	238	162	1	56	AO101 Minimum	BYTE	1	x0
B3.2.10	236	162	1	57	AO101 Filter Time	INTEGER	2	x100
B3.2.11	239	162	1	58	AO101 Scale	INTEGER	2	x0
B3.2.12	237	162	1	59	AO101 Inversion	BYTE	1	x0
B3.2.13	240	162	1	60	AO101 Offset	INTEGER	2	x100

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
B3.2.14	898	162	1	64	AO102 Mode	BYTE	1	x0
B3.2.15	269	162	1	65	AO102 Function	BYTE	1	x0
B3.2.16	270	162	1	66	AO102 Minimum	BYTE	1	x0
B3.2.17	271	162	1	67	AO102 Filter Time	INTEGER	2	x100
B3.2.18	272	162	1	68	AO102 Scale	INTEGER	2	x0
B3.2.19	273	162	1	69	AO102 Inversion	BYTE	1	x0
B3.2.20	274	162	1	70	AO102 Offset	INTEGER	2	x100
B4.1.1	883	162	1	26	Board Status	BYTE	1	x0
B4.1.2	1064	162	1	29	Slot A: FW Version	INTEGER	4	x0
B4.1.3	900	162	1	38	RO101-103 Status	BYTE	1	x0
B4.2.1	540	162	1	39	RO101 Function	BYTE	1	x0
B4.2.2	541	162	1	40	RO102 Function	BYTE	1	x0
B4.2.3	551	162	1	41	RO103 Function	BYTE	1	x0
B5.1.1	883	162	1	26	Board Status	BYTE	1	x0
B5.1.2	1064	162	1	29	Slot A: FW Version	INTEGER	4	x0
B5.1.3	905	162	1	42	PT100-100 Status	INTEGER	6	x0
B5.1.4	902	162	1	43	PT100-100 Temperature	INTEGER	6	x0
B5.2.1	901	162	1	44	PT100-100 Select	BYTE	1	x0
B5.2.2	338	162	1	45	PT100-100 WarnLevel	INTEGER	2	x10
B5.2.3	339	162	1	46	PT100-100 FaultLevel	INTEGER	2	x10
B6.1.1	883	162	1	26	Board Status	BYTE	1	x0
B6.1.2	1064	162	1	29	Slot A: FW Version	INTEGER	4	x0
B6.1.3	908	162	1	47	DI101-103 Status (6DI-240V)	BYTE	1	x0
B6.1.4	1696	162	1	48	DI104-106 Status (I6DI-240V)	BYTE	1	x0
B7.1.1	883	162	1	26	Board Status	BYTE	1	x0
B7.1.2	1064	162	1	29	Slot A: FW Version	INTEGER	4	x0
B7.1.3	3502	162	1	9	n-Encoder 1 speed	INTEGER	2	x0
B7.1.4	3504	162	1	10	n-Encoder 2 speed	INTEGER	2	x0
B7.1.5	3973	162	1	22	Encoder Power Supply	BYTE	1	x0
B7.2.1	3503	162	1	11	Encoder 1 Pulse Count	INTEGER	2	x0
B7.2.2	3505	162	1	12	Encoder 1 Rotation Reverse	BYTE	1	x0
B7.2.3	3507	162	1	13	Encoder 2 Pulse Count	INTEGER	2	x0
B7.2.4	3508	162	1	14	Encoder 2 Rotation Reverse	BYTE	1	x0
B7.2.5	3835	162	1	15	Encoder 1 Type	BYTE	1	x0
B7.2.6	3836	162	1	16	Encoder 2 Type	BYTE	1	x0
B7.2.7	3780	162	1	17	Encoder Output Select	BYTE	1	x0
B7.2.8	3781	162	1	18	Encoder Output Divider	BYTE	1	x0
B7.2.9	3967	162	1	23	Encode1 Speed filter Time	INTEGER	2	x0
B7.2.10	3968	162	1	24	Encode2 Speed Filter Time	INTEGER	2	x0
B8.1.1	883	162	1	26	Board Status	BYTE	1	x0
B8.1.2	1064	162	1	29	Slot A: FW Version	INTEGER	4	x0
B8.1.3	3502	162	1	9	n-Encoder 1 speed	INTEGER	2	x0
B8.1.4	3504	162	1	10	n-Encoder 2 speed	INTEGER	2	x0
B8.1.5	3973	162	1	22	Encoder Power Supply	BYTE	1	x0
B8.2.1	3503	162	1	11	Encoder 1 Pulse Count	INTEGER	2	x0
B8.2.2	3505	162	1	12	Encoder 1 Rotation Reverse	BYTE	1	x0
B8.2.3	3507	162	1	13	Encoder 2 Pulse Count	INTEGER	2	x0
B8.2.4	3508	162	1	14	Encoder 2 Rotation Reverse	BYTE	1	x0
B8.2.5	3835	162	1	15	Encoder 1 Type	BYTE	1	x0
B8.2.6	3836	162	1	16	Encoder 2 Type	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
B8.2.7	3967	162	1	23	Encode1 Speed filter Time	INTEGER	2	x0
B8.2.8	3968	162	1	24	Encode2 Speed Filter Time	INTEGER	2	x0
B10.1.1	910	162	1	73	Board Status	BYTE	1	x0
B10.1.2	1067	162	1	76	Slot B: FW Version	INTEGER	4	x0
B10.1.3	915	162	1	77	DI201-203 Status (3DI/3DO/1Th)	BYTE	1	x0
B10.1.4	914	162	1	78	DO201-203 Status (3DI/3DO/1Th)	BYTE	1	x0
B10.1.5	917	162	1	79	Thermistor201 Resistance	DOUBLE	4	x0
B10.1.6	913	162	1	80	Thermistor201 State	BYTE	1	x0
B10.2.1	244	162	1	81	DO201 Function	BYTE	1	x0
B10.2.2	245	162	1	82	DO202 Function	BYTE	1	x0
B10.2.3	246	162	1	83	DO203 Function	BYTE	1	x0
B10.2.4	916	162	1	84	Thermistor201 Mode	BYTE	1	x0
B11.1.1	910	162	1	73	Board Status	BYTE	1	x0
B11.1.2	1067	162	1	76	Slot B: FW Version	INTEGER	4	x0
B11.1.3	920	162	1	85	AI201 (1AI/2AO)	INTEGER	2	x1000
B11.1.4	923	162	1	86	AO201 (1AI/2AO)	INTEGER	2	x1000
B11.1.5	925	162	1	117	AO202 (1AI/2AO)	INTEGER	2	x1000
B11.2.1	919	162	1	245	AI201 Mode	BYTE	1	x0
B11.2.2	129	162	1	97	AI201 Signal Range	BYTE	1	x0
B11.2.3	130	162	1	99	AI201 Custom Min	INTEGER	2	x100
B11.2.4	131	162	1	100	AI201 Custom Max	INTEGER	2	x100
B11.2.5	128	162	1	101	AI201 Filter Time	INTEGER	2	x100
B11.2.6	132	162	1	102	AI201 Signal Invert	BYTE	1	x0
B11.2.7	922	162	1	103	AO201 Mode	BYTE	1	x0
B11.2.8	275	162	1	104	AO201 Function	BYTE	1	x0
B11.2.9	276	162	1	105	AO201 Minimum	BYTE	1	x0
B11.2.10	277	162	1	87	AO201 Filter Time	INTEGER	2	x100
B11.2.11	278	162	1	88	AO201 Scale	INTEGER	2	x0
B11.2.12	279	162	1	89	AO201 Inversion	BYTE	1	x0
B11.2.13	280	162	1	90	AO201 Offset	INTEGER	2	x100
B11.2.14	924	162	1	91	AO202 Mode	BYTE	1	x0
B11.2.15	281	162	1	92	AO202 Function	BYTE	1	x0
B11.2.16	282	162	1	93	AO202 Minimum	BYTE	1	x0
B11.2.17	283	162	1	94	AO202 Filter Time	INTEGER	2	x100
B11.2.18	284	162	1	95	AO202 Scale	INTEGER	2	x0
B11.2.19	285	162	1	96	AO202 Inversion	BYTE	1	x0
B11.2.20	286	162	1	98	AO202 Offset	INTEGER	2	x100
B12.1.1	910	162	1	73	Board Status	BYTE	1	x0
B12.1.2	1067	162	1	76	Slot B: FW Version	INTEGER	4	x0
B12.1.3	926	162	1	106	RO201-203 Status	BYTE	1	x0
B12.2.1	552	162	1	107	RO201 Function	BYTE	1	x0
B12.2.2	555	162	1	108	RO202 Function	BYTE	1	x0
B12.2.3	556	162	1	109	RO203 Function	BYTE	1	x0
B13.1.1	910	162	1	73	Board Status	BYTE	1	x0
B13.1.2	1067	162	1	76	Slot B: FW Version	INTEGER	4	x0
B13.1.3	931	162	1	110	PT100-200 State	INTEGER	6	x0
B13.1.4	928	162	1	111	PT100-200 Temperature	INTEGER	6	x0
B13.2.1	927	162	1	112	PT100-200 Select	BYTE	1	x0
B13.2.2	937	162	1	113	PT100-200 Warning Limit	INTEGER	2	x10
B13.2.3	938	162	1	114	PT100-200 Fault Limit	INTEGER	2	x10

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
B14.1.1	910	162	1	73	Board Status	BYTE	1	x0
B14.1.2	1067	162	1	76	Slot B: FW Version	INTEGER	4	x0
B14.1.3	934	162	1	115	DI201-203 Status (6DI-240V)	BYTE	1	x0
B14.1.4	1697	162	1	116	DI204-206 Status (I6DI-240V)	BYTE	1	x0
B16.1.1	3544	162	1	120	Slot C: Board Status	BYTE	1	x0
B16.1.2	3548	162	1	123	Slot C: FW Version	INTEGER	4	x0
B16.1.3	3555	162	1	124	DI301-303 Status (3DI/3DO/1Th)	BYTE	1	x0
B16.1.4	3554	162	1	125	DO301-303 Status (3DI/3DO/1Th)	BYTE	1	x0
B16.1.5	3557	162	1	126	Thermistor301 Resistance	DOUBLE	4	x0
B16.1.6	3553	162	1	127	Thermistor301 Status	BYTE	1	x0
B16.2.1	3550	162	1	128	DO301 Function	BYTE	1	x0
B16.2.2	3551	162	1	129	DO302 Function	BYTE	1	x0
B16.2.3	3552	162	1	130	DO303 Function	BYTE	1	x0
B16.2.4	3556	162	1	131	Thermistor301 Mode	BYTE	1	x0
B17.1.1	3544	162	1	120	Slot C: Board Status	BYTE	1	x0
B17.1.2	3548	162	1	123	Slot C: FW Version	INTEGER	4	x0
B17.1.3	3577	162	1	132	AI301 (I1AI/2AO)	INTEGER	2	x1000
B17.1.4	3580	162	1	133	AO301 (1AI/2AO)	INTEGER	2	x1000
B17.1.5	3582	162	1	134	AO302 (1AI/2AO)	INTEGER	2	x1000
B17.2.1	3576	162	1	135	AI301 Mode	BYTE	1	x0
B17.2.2	3560	162	1	136	AI301 Signal Range	BYTE	1	x0
B17.2.3	3561	162	1	137	AI301 Min	INTEGER	2	x100
B17.2.4	3562	162	1	138	AI301 Max	INTEGER	2	x100
B17.2.5	3575	162	1	139	AI301 t-Filter	INTEGER	2	x100
B17.2.6	3559	162	1	140	AI301 Invert	BYTE	1	x0
B17.2.7	3579	162	1	141	AO301 Mode	BYTE	1	x0
B17.2.8	3563	162	1	142	AO301 Function	BYTE	1	x0
B17.2.9	3564	162	1	143	AO301 Min	BYTE	1	x0
B17.2.10	3565	162	1	144	AO301 t-Filter	INTEGER	2	x100
B17.2.11	3566	162	1	145	AO301 Scale	INTEGER	2	x0
B17.2.12	3567	162	1	146	AO301 Invert	BYTE	1	x0
B17.2.13	3568	162	1	147	AO301 Offset	INTEGER	2	x100
B17.2.14	3581	162	1	148	AO302 Mode	BYTE	1	x0
B17.2.15	3569	162	1	149	AO302 Function	BYTE	1	x0
B17.2.16	3570	162	1	150	AO302 Min	BYTE	1	x0
B17.2.17	3571	162	1	151	AO302 t-Filter	INTEGER	2	x100
B17.2.18	3572	162	1	152	AO302 Scale	INTEGER	2	x0
B17.2.19	3573	162	1	153	AO302 Invert	BYTE	1	x0
B17.2.20	3574	162	1	154	AO302 Offset	INTEGER	2	x100
B18.1.1	3544	162	1	120	Slot C: Board Status	BYTE	1	x0
B18.1.2	3548	162	1	123	Slot C: FW Version	INTEGER	4	x0
B18.1.3	3586	162	1	155	RO301-303 Status	BYTE	1	x0
B18.2.1	3583	162	1	156	RO301 Function	BYTE	1	x0
B18.2.2	3584	162	1	157	RO302 Function	BYTE	1	x0
B18.2.3	3585	162	1	158	RO303 Function	BYTE	1	x0
B19.1.1	3544	162	1	120	Slot C: Board Status	BYTE	1	x0
B19.1.2	3548	162	1	123	Slot C: FW Version	INTEGER	4	x0
B19.1.3	3593	162	1	159	PT100-300 Status	INTEGER	6	x0
B19.1.4	3590	162	1	160	PT100-300 Temperature	INTEGER	6	x0
B19.2.1	3587	162	1	161	PT100-300 Select	BYTE	1	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
B19.2.2	3588	162	1	162	PT100-300 WarnLevel	INTEGER	2	x10
B19.2.3	3589	162	1	163	PT100-300 FaultLevel	INTEGER	2	x10
B20.1.1	3544	162	1	120	Slot C: Board Status	BYTE	1	x0
B20.1.2	3548	162	1	123	Slot C: FW Version	INTEGER	4	x0
B20.1.3	3596	162	1	164	DI301-303 Status (6DI-240V)	BYTE	1	x0
B20.1.4	3597	162	1	165	DI304-306 Status (I6DI-240V)	BYTE	1	x0
B22.1.1	3657	162	1	168	Slot D: Board Status	BYTE	1	x0
B22.1.2	3661	162	1	170	Slot D: FW Version	INTEGER	4	x0
B22.1.3	3668	NA	NA	NA	DI401-403 Status (3DI/3DO/1Th)	BYTE	1	x0
B22.1.4	3667	NA	NA	NA	DO401-403 Status (3DI/3DO/1Th)	BYTE	1	x0
B22.1.5	3670	NA	NA	NA	Thermistor401 Resistance	DOUBLE	4	x0
B22.1.6	3666	NA	NA	NA	Thermistor401 Status	BYTE	1	x0
B22.2.1	3663	162	1	171	DO401 Function	BYTE	1	x0
B22.2.2	3664	162	1	172	DO402 Function	BYTE	1	x0
B22.2.3	3665	162	1	173	DO403 Function	BYTE	1	x0
B22.2.4	3669	NA	NA	NA	Thermistor401 Mode	BYTE	1	x0
B23.1.1	3657	162	1	168	Slot D: Board Status	BYTE	1	x0
B23.1.2	3661	162	1	170	Slot D: FW Version	INTEGER	4	x0
B23.1.3	3690	NA	NA	NA	AI401 (1AI/2AO)	INTEGER	2	x1000
B23.1.4	3693	NA	NA	NA	AO401 (1AI/2AO)	INTEGER	2	x1000
B23.1.5	3695	NA	NA	NA	AO402 (1AI/2AO)	INTEGER	2	x1000
B23.2.1	3689	NA	NA	NA	AI401 Mode	BYTE	1	x0
B23.2.2	3673	162	1	175	AI401 Signal Range	BYTE	1	x0
B23.2.3	3674	162	1	176	AI401 Min	INTEGER	2	x100
B23.2.4	3675	162	1	177	AI401 Max	INTEGER	2	x100
B23.2.5	3688	NA	NA	NA	AI401 t-Filter	INTEGER	2	x100
B23.2.6	3672	162	1	174	AI401 Invert	BYTE	1	x0
B23.2.7	3692	NA	NA	NA	AO401 Mode	BYTE	1	x0
B23.2.8	3676	162	1	178	AO401 Function	BYTE	1	x0
B23.2.9	3677	162	1	179	AO401 Min	BYTE	1	x0
B23.2.10	3678	162	1	180	AO401 t-Filter	INTEGER	2	x100
B23.2.11	3679	162	1	181	AO401 Scale	INTEGER	2	x0
B23.2.12	3680	162	1	182	AO401 Invert	BYTE	1	x0
B23.2.13	3681	162	1	183	AO401 Offset	INTEGER	2	x100
B23.2.14	3694	NA	NA	NA	AO402 Mode	BYTE	1	x0
B23.2.15	3682	162	1	184	AO402 Function	BYTE	1	x0
B23.2.16	3683	162	1	185	AO402 Minimum	BYTE	1	x0
B23.2.17	3684	162	1	186	AO402 t-Filter	INTEGER	2	x100
B23.2.18	3685	162	1	187	AO402 Scale	INTEGER	2	x0
B23.2.19	3686	162	1	188	AO402 Invert	BYTE	1	x0
B23.2.20	3687	162	1	189	AO402 Offset	INTEGER	2	x100
B24.1.1	3657	162	1	168	Slot D: Board Status	BYTE	1	x0
B24.1.2	3661	162	1	170	Slot D: FW Version	INTEGER	4	x0
B24.1.3	3699	NA	NA	NA	RO401-403 Status	BYTE	1	x0
B24.2.1	3696	162	1	190	RO401 Function	BYTE	1	x0
B24.2.2	3697	162	1	191	RO402 Function	BYTE	1	x0
B24.2.3	3698	162	1	192	RO403 Function	BYTE	1	x0
B25.1.1	3657	162	1	168	Slot D: Board Status	BYTE	1	x0
B25.1.2	3661	162	1	170	Slot D: FW Version	INTEGER	4	x0
B25.1.3	3706	NA	NA	NA	PT100-400 Status	INTEGER	6	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	Parameter description	Data type	Length (in bytes)	Display format
B25.1.4	3703	NA	NA	NA	PT100-400 Temperature	INTEGER	6	x0
B25.2.1	3700	NA	NA	NA	PT100-400 Select	BYTE	1	x0
B25.2.2	3701	NA	NA	NA	PT100-400 WarnLevel	INTEGER	2	x10
B25.2.3	3702	NA	NA	NA	PT100-400 FaultLevel	INTEGER	2	x10
B26.1.1	3657	162	1	168	Slot D: Board Status	BYTE	1	x0
B26.1.2	3661	162	1	170	Slot D: FW Version	INTEGER	4	x0
B26.1.3	3709	NA	NA	NA	DI401-403 Status (6DI-240V)	BYTE	1	x0
B26.1.4	3710	NA	NA	NA	DI404-406 Status (I6DI-240V)	BYTE	1	x0
B27.1.1.1	3657	162	1	168	Slot D: Board Status	BYTE	1	x0
B27.1.1.2	3661	162	1	170	Slot D: FW Version	INTEGER	4	x0
B27.1.1.3	3799	NA	NA	NA	PN400 ProtocolStatus	BYTE	1	x0
B27.1.1.4	3731	NA	NA	NA	PB400 Telegram	INTEGER	2	x0
B27.1.1.5	3784	NA	NA	NA	PB400 MAC Address	BYTE	6	x0
B27.1.1.6	3793	NA	NA	NA	PB400 Active IP Address	BYTE	4	x0
B27.1.1.7	3795	NA	NA	NA	PB400 Active Subnet Mask	BYTE	4	x0
B27.1.1.8	3797	NA	NA	NA	PB400 Active Default Gateway	BYTE	4	x0
B27.1.2.1	3977	NA	NA	NA	PB400 COM Mode	BYTE	1	x0
B27.1.2.2	2852	160	1	222	IP Address Mode	BYTE	1	x0
B27.1.2.3	2853	160	1	223	Static IP Address	BYTE	4	x0
B27.1.2.4	2855	160	1	224	Static Subnet Mask	BYTE	4	x0
B27.1.2.5	2857	160	1	225	Static Default Gateway	BYTE	4	x0
B27.1.2.6	3202	NA	NA	NA	Station Name		20	x0
B27.1.2.7	3983	160	1	84	SlotD Fieldbus Fault Response	BYTE	1	x0
B27.2.1.1	3732	NA	NA	NA	FaultCounter Profibus Fault Slot D	INTEGER	2	x0
B27.2.1.2	3733	NA	NA	NA	PB400 Fault Situations Max	INTEGER	4	x0
B27.2.1.3	3735	NA	NA	NA	PB400 PDP-ProfilNumber	INTEGER	2	x0
B27.2.1.4	3736	NA	NA	NA	PB400 PDP-Controlword	INTEGER	2	x0
B27.2.1.5	3737	NA	NA	NA	PB400 PDP-Statusword	INTEGER	2	x0
B27.2.1.6	2621	NA	NA	NA	PDP-MaxBlockLength	INTEGER	2	x0
B27.2.1.7	2622	NA	NA	NA	PDP-NoOfMultiparameter	BYTE	1	x0
B27.2.1.8	2623	NA	NA	NA	PDP-MaxLatency	BYTE	1	x0
B27.2.1.9	2624	NA	NA	NA	PDP-DO Manufacturer	INTEGER	2	x0
B27.2.1.10	1451	NA	NA	NA	PDP-DO Device Type	INTEGER	2	x0
B27.2.1.11	2628	NA	NA	NA	PDP-DO NoOfDOs	BYTE	1	x0
B27.2.1.12	2629	NA	NA	NA	PDP-DO Subclass	BYTE	1	x0
B27.2.2.1	3748	NA	NA	NA	PB400 Parameter Access	INTEGER	2	x0
B27.2.2.2	3749	NA	NA	NA	PB400 Control Priority	INTEGER	2	x0
B27.2.2.3	3750	NA	NA	NA	PB400 Fault Situation Counter	INTEGER	2	x0
B28.1.1	3793	160	1	226	PB400 Active IP Address	BYTE	4	x0
B28.1.2	3795	160	1	227	PB400 Active Subnet Mask	BYTE	4	x0
B28.1.3	3797	160	1	228	PB400 Active Default Gateway	BYTE	4	x0
B28.1.4	3784	160	1	230	PB400 MAC Address	BYTE	6	x0
B28.1.5	3657	162	1	168	Slot D: Board Status	BYTE	1	x0
B28.1.6	608	161	1	90	Ethernet IP Protocol Status	BYTE	1	x0
B28.1.7	3661	162	1	170	Slot D: FW Version	INTEGER	4	x0
B28.2.1	3779	160	1	222	EIP CtrB IP Address Mode	BYTE	1	x0
B28.2.2	2853	160	1	223	Static IP Address	BYTE	4	x0
B28.2.3	2855	160	1	224	Static Subnet Mask	BYTE	4	x0
B28.2.4	2857	160	1	225	Static Default Gateway	BYTE	4	x0
B28.2.5	4010	162	1	249	EIP CtrB COM Timeout	INTEGER	2	x0

Table 50. PowerXL DX1 Parameter ID list, continued

Menu item no.	Modbus ID	EtherNet/IP			Parameter description	Data type	Length (in bytes)	Display format
		Class	Instance	Attribute				
B28.2.6	3983	160	1	84	SlotD Fieldbus Fault Response	BYTE	1	x0
O1	1	160	1	1	Output Frequency	INTEGER	2	x100
O2	3912	161	1	171	Speed Reference	DOUBLE	4	x100
O3	3975	4	129	3	Motor Speed	DOUBLE	4	x100
O4	3	160	1	3	Motor Current	INTEGER	2	x10
O5	4	4	129	3	Motor Torque	INTEGER	2	x10
O6	5	160	1	5	Motor Power	INTEGER	2	x10
O7	6	160	1	6	Motor Voltage	INTEGER	2	x10
O8	7	160	1	7	DC-link Voltage	INTEGER	2	x0
O9	8	160	1	8	Unit Temperature	INTEGER	2	x10
O10	9	160	1	9	Motor Temperature	INTEGER	2	x10
R11	782	160	1	241	Keypad Torque Ref	INTEGER	2	x10
R12	3914	160	1	63	Keypad Reference	DOUBLE	4	x100
R13	1307	NA	NA	NA	PID1 Keypad Set Point 1	DOUBLE	4	x100
R14	1309	NA	NA	NA	PID1 Keypad Set Point 2	DOUBLE	4	x100

Appendix B—process data values

Process data OUT (slave → master)

The fieldbus master can read the frequency converter's actual values using process data variables. All software applications use process data as follows:

Table 51. Process data OUT (slave → master)

Data	Value	Unit	Scale	Default, Min., Max.
Process data out 1	Output frequency	Hz	0.01 Hz	
Process data out 2	Unit Temperature	Deg.C	0.1 Deg.C	
Process data out 3	Motor current	A	0.1 A	
Process data out 4	Motor torque	%	0.10%	
Process data out 5	Motor power	%	0.10%	
Process data out 6	Motor voltage	V	0.1 V	
Process data out 7	DC link voltage	V	1 V	
Process data out 8	Latest fault code	—	—	
Process data out 9	Not Assigned	—	—	
Process data out 10	Not Assigned	—	—	
Process data out 11	Not Assigned	—	—	
Process data out 12	Not Assigned	—	—	

Note: The communication parameter group in any application has a selector parameter for every process data.The monitoring values and drive parameters can be selected using the ID number. Default selections are shown in the table above. Reference **Appendix A** for Modbus IDs that can be set via the keypad FB Process Data Out group.

Process data IN (master → slave)

Control word, Reference and Process Data are used with All-in-One applications as follows:

Table 52. Process data IN (master → slave) for all applications

Data	Value	Unit	Scale	Default
Process Data in 1	Not Assigned	—	—	—
Process Data in 2	Not Assigned	—	—	—
Process Data in 3	Not Assigned	—	—	—
Process Data in 4	Not Assigned	—	—	—
Process Data in 5	Not Assigned	—	—	—
Process Data in 6	Not Assigned	—	—	—
Process Data in 7	Not Assigned	—	—	—
Process Data in 8	Not Assigned	—	—	—
Process Data in 9	Not Assigned	—	—	—
Process Data in 10	Not Assigned	—	—	—
Process Data in 11	Not Assigned	—	—	—
Process Data in 12	Not Assigned	—	—	—

Note: The communication parameter group in any application has a selector parameter for every process data. The monitoring values and drive parameters can be selected using the ID number. Default selections are shown in the table above. Reference Appendix A for Modbus IDs that can be set via the keypad B Process Data IN group.

When configuring the Process Data parameters for the drive, there are many parameters which can monitored over the fieldbus and selected using the communications settings group menu items.

Menu item	Parameter	Parameter number	Default monitored parameter
P96.2.1	FB Data Out 1 Sel	1	Output Frequency
P96.2.2	FB Data Out 2 Sel	8	Unit Temperature
P96.2.3	FB Data Out 3 Sel	3	Motor Current
P96.2.4	FB Data Out 4 Sel	4	Motor Torque
P96.2.5	FB Data Out 5 Sel	5	Motor Power
P96.2.6	FB Data Out 6 Sel	6	Motor Voltage
P96.2.7	FB Data Out 7 Sel	7	DC-link Voltage
P96.2.8	FB Data Out 8 Sel	28	Latest Fault code
P96.2.9	FB Data Out 9 Sel	9	Not Assigned
P96.2.10	FB Data Out 10 Sel	10	Not Assigned
P96.2.11	FB Data Out 11 Sel	11	Not Assigned
P96.2.12	FB Data Out 12 Sel	12	Not Assigned

However, since these Menu Items are read write items, these monitored parameters can be modified to any parameter in the drive by simply changing the value for the menu item. For example, if in **FB Data Out 8** one wanted to monitor the state of the Digital Inputs D1 to D3 they would change **Process Data Out 8** from a 28 to a 12. For a complete list of parameters please refer to Communication Application Guide which can be found on the drives web site.

Typically the parameters which are monitored over fieldbus are the same types of parameters monitored on the Monitoring menu of the drive, a list of those parameters and IDs are provided below.

Parameter ID	Description	Parameter ID	Description
1	Output Frequency	16	PID1 Set Point
2	Motor Speed	18	PID1 Feedback
3	Motor Current	20	PID1 Error Value
4	Motor Torque	22	PID1 Output
5	Motor Power	23	PID1 Status
6	Motor Voltage	24	Freq Reference
7	DC-link Voltage	25	Analog Output 1
8	Unit Temperature	26	Running Motors
9	Motor Temperature	27	PT100 Temperature
10	Analog Input 1	28	Last Active Fault
11	Analog Input 2	30	Multi-Monitoring
12	DI1, DI2, DI3	32	PID2 Set Point
13	DI4, DI5, DI6	34	PID2 Feedback
14	DO1	36	PID2 Error Value
15	Torque Reference	38	PID2 Output
		39	PID2 Status

Appendix C—fault codes

Fault codes

Table 53. PowerXL DX1 fault code list

Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
1	Over Current	Over Current	Fault		8736	0x2310	• Sudden heavy load increase • Short circuit in motor cables • Unsuitable motor	• Check loading • Check motor • Check cables and connections • Make identification run • Check ramp times
2	Over Voltage	Over Voltage	Fault		12816	0x3210	• Too short a deceleration time • Brake chopper is disabled • High overvoltage spikes in supply • Start/Stop sequence too fast	• Make deceleration time longer • Use brake chopper or brake resistor (available as options) • Activate overvoltage controller • Check input voltage
3	Earth Fault	Earth Fault	Configurable	Fault	8768	0x2330	Insulation failure in cables or motor.	Check motor cables and motor. DG1 FR7-8 only fault, can't change fault type.
6	Ext Fault-AR	Emergency Stop	Fault		21121	0xA001	Emergency signal from DI is inactive	Close input signal from DI.
7	Saturation Trip	Saturation Trip	Fault		29040	0xA002	IGBT module is damaged.	• Check cables and connections • Reset the fault and restart verify that EMC screw is installed • Should the fault re-occur, contact the distributor near to you
9	Under Voltage Fault	UnderVoltage	Configurable	Fault	12832	0x3220	• Most probable cause: Too low a supply voltage • AC drive internal fault • Defect input fuse • External charge switch not closed Note: This fault is activated only if the drive is in Run state.	In case of temporary supply voltage break, reset the fault and restart the AC drive. Check the supply voltage. If it is adequate, an internal failure has occurred. Contact the nearest distributor.
10	Input Phase Superv	Input Phase Spv	Configurable	Fault	8528	0xA004	Input line phase is missing	Check supply voltage, fuses and cable
11	Output Phase Superv	Output Phase Spv	Configurable	Fault	9040	0xA005	Current measurement has detected that there is no current in one motor phase	Check motor cable and motor
12	Brake Chopper Superv	BrakeChopperSpv	Fault		28944	0x7110	• Brake resistor is broken • Brake chopper failure	Check brake resistor and cabling. If these are OK, the chopper is faulty. Contact the nearest distributor.
13	Drive Under Temp	Drive UnderTemp	Configurable	Fault	16928	0x4320	Heat sink temperature is below –10 °C	• The ambient temperature is too low • If the ambient temperature is normal, please contact a distributor near you.
14	Drive OverTemp Fault	Drive OverTemp	Fault		16912	0x4310	Heat sink temperature is over 90 °C	Check the correct amount and flow of cooling air • Check the heat sink for dust • Check the ambient temperature • Make sure that the switching frequency is not too high in relation to ambient temperature and motor load
15	Motor Stalled	Motor Stalled	Configurable	No Action	28963	0x7121	Motor is stalled	Check motor and load
16	Motor Overload	Motor OverTemp	Configurable	No Action	17168	0x4210	Motor is too hot, based on either the drive's estimate or on temperature feedback	Decrease motor load. If no motor overload exists, check the temperature model parameters.
17	Motor Under Load	Motor UnderLoad	Configurable	No Action	28979	29 (Dec)	Condition defined by parameter ID317 / ID318 / ID319 have been valid longer than the time defined by ID321	Check load

Table 53. PowerXL DX1 fault code list, continued

Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
18	IP Address Conflict	IP conflict	Configurable	Warning	30070	0xA006	The term "IP conflict" refers to a situation in networking where two or more devices on the same network are assigned the same IP address. This causes issues because IP addresses are unique identifiers for devices on a network, and having more than one device with the same address can lead to communication problems.	Resolving an IP conflict typically involves ensuring that each device has a unique IP address.
19	Power Board EEPROM Fault	Power board EEPROM Fault	Fault		22050	0xA007	• Power board EEPROM chip damage • Power board EEPROM and control board not connected normal • Power board EEPROM data error	Check the connection of the 8-pin terminal on the control board and the main power board. Try power cycling to see if the error persists. If it still reports an error, please contact the nearest distributor.
20	Control Board EEPROM Fault	FRAM Fault	Fault		22033	0xA008	• Control board EEPROM chip damage • Control board EEPROM data error	Try to clear this fault. If it cannot be cleared, attempt a power cycle to see if the error persists. If it still reports an error, please contact the nearest distributor.
21	S-Flash Fault	Serial Flash Fault	Warning		22051	0xA009	• Serial flash chip damage • Serial flash data error	Try to clear this fault. If it cannot be cleared, attempt a power cycle to see if the error persists. If it still reports an error, please contact the nearest distributor.
22	Speed Deviation	Speed Deviation	Fault		33332	0xA05C	Estimated speed is greater than 115% of maximum frequency. Or current loop is oscillating.	Check motor parameters and run identification. Adjust the speed control Kp and Ti.
23	STO Fault	STO Fault	Fault		21665	0xA071	1) STO1 or STO2 is open 2) Control board STO1/STO2 diagnostic failed. 3) FS card STO1/STO2 diagnostic failed if FS is on board 3) STO OE is over voltage	• Check STO1 and STO2 connections • If the fault recurs, contact your local/nearest service center or distributor
25	Watchdog Fault	MCU WatchDog Fault	Fault		24848	0x6010	Application code run abnormal.	Try to clear this fault. If it cannot be cleared, attempt a power cycle to see if the error persists. If it still reports an error, please contact the nearest distributor.
26	Start-up Prevent	Start-up Prevent	Fault		35585	0xA00A	The interlock signal is invalid within the set time.	Check the interlock signal, then power cycle the device. If the fault persists, please contact the nearest distributor.
29	Thermistor Fault	Thermistor Fault	Configurable	Fault	28978	0x7300	Option board or control board thermistor resistor lager than 4.7K	Check the configuration and hardware connection of the thermistor, and verify the resistance value of the thermistor.
32	Fan Cooling	Fan Cooling	Configurable	Fault	28689	0xA00B	Fan is damaged or stalled.	Check the fan and its connections, and confirm that the fan is connected to 24 Vdc.
37	Device Change	Device Change	Warning		35360	0xA00C	A new card or new power board is connected.	If a new card or new power board is connected, the device will report this fault, which will automatically clear after some time. Power cycling the device will also clear this fault.
38	Device Added	Device Added	Warning		35361	0xA00D	A card or power board is connected.	Power cycling the device will also clear this fault.
40	Device Unknown	Device Unknown	Fault		35363	0xA00F	Unknown device connected (power board/option board).	• Check EEPROM connection • Check board connection on slot A/B/C/D • Power cycle to drive

Table 53. PowerXL DX1 fault code list, continued

Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
41	IGBT Over Temp	IGBT Temperature	Fault		16913	66 (Dec)	IGBT temperature is too high.	Check output loading • Check motor size • Decrease switching frequency
50	AI < 4mA (4to20mA)	AIN<4mA(4to20mA)	Configurable	No Action	29520	0xA011	Loss in analog input signal, dropped below 4 mA.	Verify analog input current reference value, check cabling.
51	External Fault	External Fault	Configurable	Fault	36864	0x9000	Digital input is activated for external fault input.	Check digital input settings and verify input level, could be an external device causing fault.
52	Keypad Comm Fault	Keypad Communication Fault	Configurable	Fault	21265	0xA012	The connection between the control keypad and frequency converter is broken.	Check keypad connection cable. Verify that the local reference is the keypad reference or that the local control location is set to keypad, and ensure that the keypad communication fault protection is not set to "No Action".
54	Option Card Fault	OPT Card Fault	Configurable	Fault	35073	0xA013	Card communication abnormality.	Check right option card and option card slot connections. Check Board Status on Keypad for exact cause of fault. Contact the nearest distributor.
56	PT100 Fault	PT100 Fault	Configurable	Fault	29536	0xA016	Temperature is beyond the limit of sensing capacity of PT100.	PT100 short, open or over temperature, check PT100 temperature probe.
57	Motor ID Fault	Motor ID fault	Fault		29072	0xA017	The Motor parameters identification running was not completed successfully.	Check motor size. Verify the input and output wiring is connected properly.
58	Current Measure Fault	Current Measure Fault	Warning		9217	0x2100	Current measurement is out of range.	Restart the drive again. If the fault reoccurs, contact the nearest distributor.
60	Control Board Overtemp	Control Board OverTemp	Fault		16914	0x4300	The control board temperature is too high, exceeding the upper limit (different voltage ratings and frame sizes have different temperature upper limits).	Check NTC resistor. Check control board temperature, restart the drive. If the fault persists, please contact the nearest distributor.
64	Replace Battery	Replace Battery	Configurable	Warning	35345	0xA019	RTC Battery voltage is too low.	Check the RTC battery voltage, contact distributor near you for replacement battery.
65	Replace Fan	Replace Fan	Configurable	Warning	28688	0xA01A	Fan life is less than 2 months.	Check the fan, clean out any contamination, contact distributor near you for replacement fan.
66	Safe Torque Off	Safety Torque Off	Configurable	Fault	21665	0xA01B	STO triggered, STO input is open.	Reset STO Trigger and verify wiring. Reset fault after input is enabled.
67	Current Limit Control	Current limit control	Warning		8786	0x2200	The output current has reached the current limit value	Check the load. Set the acceleration time longer.
68	Over Voltage Control	Over voltage control	Warning		12817	0x3310	The DC link voltage has reached its voltage limit value.	Check the input voltage. Set the acceleration/ deceleration time longer.
70	DSP parameter fault	DSP parameter fault	Fault		22018	0xA01D	The MCU sent parameters with a value of 0 to the DSP.	Do the factory reset operation. If the fault persists, please contact the nearest distributor.
82	Bypass Overload	BypassOverLoad	Fault		28980	0xA025	During bypass, the motor is overloaded.	Check the load condition of the equipment. If there is no overload, please contact the nearest distributor.

Table 53. PowerXL DX1 fault code list, continued

Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
83	FieldBus RTU Fault	FieldBus RTU Fault	Configurable	Fault	30064	0xA026	(1) DCI_ubRTUFaultBehavior parameter's value is 0, Loss of communication with Modbus RTU, and the fieldbus reference is the remote reference and the fieldbus control place is the RTU_Fieldbus control place, and the fault protection DCI_ubFieldbusFaultProtect is not "NO action"; (2) DCI_ubRTUFaultBehavior parameter's value is 1, Loss of communication with Modbus RTU and the fault protection DCI_ubFieldbusFaultProtect is not "NO action"; Note: If remote control place is not RTU_Fieldbus then on communication loss it would be Warning.	Check RS485 communication wiring. Verify drive parameters are set correctly. Check master programming to verify proper addressing.
84	FieldBus TCP Fault	FieldBus TCP Fault	Configurable	Fault	30065	0xA027	(1) DCI_ubTCPFaultBehavior parameter's value is 0, Loss of communication with Modbus TCP, and the fieldbus reference is the remote reference and the fieldbus control place is the TCP_Fieldbus remote control place, and the fault protection DCI_ubTCPFieldbusFaultProtect is not "NO action"; (2) DCI_ubTCPFaultBehavior parameter's value is 1, Loss of communication with Modbus TCP and the fault protection DCI_ubTCPFieldbusFaultProtect is not "NO action"; Note: If remote control place is not TCP_Fieldbus then on communication loss it would be Warning.	Check Ethernet communication wiring. Verify drive parameters are set correctly. Check master programming to verify proper addressing.
90	Drive Under Temp	Cold Weather Drive Under Temp	Configurable	Warning	16929	0x3221	• Cold weather mode is not enabled, and unit temperature is less than -10 degree. • Cold weather mode is enabled and Under Temp Fault Override is not set, unit temperature is less than 30 degree. • Cold weather mode is enabled and Under Temp Fault Override is not set, unit temperature is -20 to -30 degree. The temp <-20 degree when cold weather start time out.	If unit temp -20 to -10 degree, start motor in cold weather mode. If unit temp <-20 degree, warm up unit above -20 deg C for proper operation using cold weather mode. If still <-20 degree when cold weather mode time out, try higher output voltage in cold weather mode.
92	External Fault 2	External Fault 2	Configurable	Fault	36865	0xA02D	Digital input is activated for external fault input.	Check digital input settings and verify input level; could be an external device causing fault.
93	External Fault 3	External Fault 3	Configurable	Fault	36866	0xA02E	Digital input is activated for external fault input.	Check digital input settings and verify input level; could be an extrnal device causing fault.
94	Pump Lost	Pump Lost	Warning		58881	0xA02F	• In single drive control mode of MPFC, include FC, interlock enable, and all interlock signals lost. • In single drive control mode of MPFC, not include FC, interlock enable, and interlock 1 lost • In multi drive network mode of MPFC, interlock enable, and interlock 1 lost	Check digital inputs for interlock.
95	Need Alternation	Need Alternation	Warning		58882	0xA030	In multi drive network mode of MPC, run time counter enable and is over limit.	Need to do motor maintenance and then reset runtime counter to clear the warning.

Table 53. PowerXL DX1 fault code list, continued

Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
97	Pipe Fill Loss	Prime Loss	Configurable	No Action	35589	0xA031	• If prime pump is disabled, the pipe fill detection value (motor current, motor power or motor torque) is less than pipe fill loss setting level. • If prime pump is enabled and the drive in the prime pump level 1 phase, the pipe fill detection value (motor current, motor power or motor torque) is less than prime pump level 1 value. • If prime pump is enabled and the drive in the prime pump level 2 phase, the pipe fill detection value (motor current, motor power or motor torque) is less than prime pump level 2 value. • If PID feedback AI is lost and the feedback AI loss protection is warning: Preset Freq, the pipe fill detection value (motor current, motor power or motor torque) is less than pipe fill loss setting level of PID feedback AI loss	Check the motor current/power/ torque of drive.
98	PID1 Feedback AI Loss	PID1 Feedback AI Loss	Configurable	No Action	33283	0xA032	The feedback function has relationship with feedback 1/2 and the feedback 1/2 source has relationship with AI, the AI signal range is 1 (20–100%/2–10 V/ 4–20 mA), the AI value is out of range (AI mode: 0–20 mA, AI < 4 mA or AI > 20 mA, AI mode: 0–10 V, AI < 2 V or AI > 10 V) of PID1 feedback.	Check the AI of PID1 feedback, the AI value whether is out of range or not, the AI range shall be 2–10 V (AI mode is 0–10 V) or 4–20 mA (AI mode is 0–20 mA).
99	PID2 Feedback AI Loss	PID2 Feedback AI Loss	Configurable	No Action	33289	0xA033	The feedback function has relationship with feedback 1/2 and the feedback 1/2 source has relationship with AI, the AI signal range is 1 (20–100%/2–10 V/ 4–20 mA), the AI value is out of range (AI mode: 0–20 mA, AI < 4 mA or AI > 20 mA, AI mode: 0–10 V, AI < 2 V or AI > 10 V) of PID2 feedback.	Check the AI of PID2 feedback, the AI value whether is out of range or not, the AI range shall be 2–10 V (AI mode is 0–10 V) or 4–20 mA (AI mode is 0–20 mA).
103	Drive OverTemp Warning	Drive OverTemp Warning	Warning		16947	0xA037	drive degree greater than (DCI_wDriveOverTempThreshold value -10 degree) and less than DCI_wDriveOverTempThreshold value, report drive over temperature warning.	Check the drive temperature and environment temperature.
115	FieldBus EIP Idle Fault	FieldBus EIP Idle Fault	Configurable	Warning	30104	0xA049	(1) DCI_ubSlotDFieldbusFaultBehavior parameter's value is 0. The fieldbus reference is the remote reference or the fieldbus control place is the EIP_Fieldbus control place, and the fault protection DCI_ubSlotDFieldbusFaultProtect is not "NO action"; Idle bit in EtherNet master Programming is not set. (2) DCI_ubSlotDFieldbusFaultBehavior parameter's value is 1, Idle bit in EtherNet master Programming is not set and the fault protection DCI_ubSlotDFieldbusFaultProtect is not "NO action"; Note: If remote control place is not EIP_Fieldbus then on communication loss it would be Warning.	Check EtherNet IP master programming to verify proper addressing and ensure Idle communication bit is set.
118	Broken Pipe	Broken Pipe	Configurable	No Action	35590	0xA048	PID feedback is less than broken pipe level and the drive output frequency is more than broken pipe frequency for delay time.	Check PID setting value and feedback.

Table 53. PowerXL DX1 fault code list, continued

Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
120	PID1 Low Feedback	PID1 Low Feedback	Configurable	No Action	33285	NA	PID1 Low feedback function is active and PID feedback is lower than set value.	Check PID setting value and feedback.
121	PID1 High Feedback	PID1 High Feedback	Configurable	No Action	33286	NA	PID1 high feedback function is active and PID feedback is higher than set value.	Check PID setting value and feedback.
122	PID2 Low Feedback	PID2 Low Feedback	Configurable	No Action	33287	NA	PID2 low feedback function is active and PID feedback is lower than set value.	Check PID setting value and feedback.
123	PID2 High Feedback	PID2 High Feedback	Configurable	No Action	33288	NA	PID2 high feedback function is active and PID feedback is higher than set value.	Check PID setting value and feedback.
124	OP Cont Interlock Fault	Op Cont Interlock Fault	Configurable	Fault	21578	NA	OP Cont Interlock function is active.	Check OP Cont interlock input signal.
133	FieldBus Web UI Fault	FieldBus Web UI Fault	Configurable	Warning	33120	0xA050	(1) DCI_WEB_UI_FAULT_BEHAVIOR parameter's value is 0, Loss of communication with Web server, and the fieldbus reference is the remote reference or the fieldbus control place is the WEbUI_Fieldbus remote control place, and the fault protection is not "NO action"; (2) DCI_WEB_UI_FAULT_BEHAVIOR parameter's value is 1, Loss of communication with Web server and the fault protection is not "NO action"; Note: If remote control place is not WEBUI_Fieldbus then on communication loss it would be Warning.	Check the web connection with RJ45 connector. Verify drive parameters are set correctly. Check the Web UI tool to know if there is proper request going to drive or not.
134	Bumpless Transfer Fail	Bumpless Transfer Fail	Warning		61698	0xA053	Bumpless enable, but no start command from new control place after bumpless transition from local to remote or vice versa.	Check whether there is no start command from new control place after bumpless transition.
135	CP Interlock Fault Run	CP Interlock Fault Run	Configurable	Fault	13570	0xA054	CP interlock input open and drive in run status.	Check CP interlock input signal.
136	CP Interlock Fault Stop	CP Interlock Fault Stop	Configurable	Warning	13571	0xA055	CP interlock input open and drive in stop status	Check CP interlock input signal.
139	M/F Supervision Fault	M/F Supervision Fault	Configurable	No Action	34561	0xA058	Drive supervision function is active.	Check supervision function settings.
140	M/F Limit Reached	M/F Limit Reached	Configurable	No Action	34562	0xA059	Motor output current has reached the limit.	Check the motor output current.
141	High Freq Pulse Input 1 fault	High Pulse DI1 fault	Configurable	No Action	41329	0xA05A	The high frequency pulse input 1 value is < Fault detect low limit or > Fault detect high limit.	Verify the high frequency pulse input 1 value.
142	High Freq Pulse Input 2 fault	High Pulse DI2 fault	Configurable	No Action	41330	0xA05B	The high frequency pulse input 2 value is < Fault detect low limit or > Fault detect high limit.	Verify the high frequency pulse input 2 value.
143	High Freq Pulse Output fault	High Pulse DO fault	Configurable	No Action	41331	0xA05D	The high frequency pulse output value is < Fault detect low limit or > Fault detect high limit.	Verify the high frequency pulse output value.
144	Speed Error	Speed Error	Configurable	No Action	29456	0x7310	The encoder speed is out of ramp generator output.	• Check speed error settings • Check encoder signals

Table 53. PowerXL DX1 fault code list, continued

Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
146	Fieldbus SlotD Fault	FieldBus SlotD Fault	Configurable	Warning	29957	0xA05F	(1) DCI_ubSlotDFieldbusFaultBehavior parameter's value is 0, Loss of communication with EIP/Profinet comm-card. The fieldbus reference is the remote reference or the fieldbus control place is the EIP_Fieldbus/ Profinet_Fieldbus control place, and the fault protection DCI_ ubSlotDFieldbusFaultProtect is not "NO action"; (2) DCI_ubSlotDFieldbusFaultBehavior parameter's value is 1, Loss of communication with EIP/Profinet comm-card and the fault protection DCI_ubSlotDFieldbusFaultProtect is not "NO action"; Note: If remote control place is not EIP_Fieldbus/Profinet_Fieldbus then on communication loss it would be Warning.	Check ProfiNet/ Dual Port Ethernet IP master communication wiring. Verify drive parameters are set correctly. Check ProfiNet/Dual Port Ethernet IP master master configuration programming to verify proper addressing.
147	AI Fault	AI Fault	Configurable	No Action	33336	0xA060	1) The AI mode is 0–20 mA: If the AI signal range is 0 to 20 mA , the analog input signal value > 20 mA If the AI signal range is 4 to 20 mA, the analog input signal value < 4 mA or > 20 mA. 2) The AI mode is 0–10 V: If the AI signal range is 0 to 10 Vdc, the analog input signal value >10 V. 3) The AI mode is -10–10 V: If the AI signal range is -10 to 10 Vdc, the analog input signal value >10 V.	Verfiy analog input signal value on either AI1 or AI2, please contact the nearest distributor.
148	ABZ Card Plug Slot Error	Card Plug Slot Error	Configurable	Fault	20481	0xA064	ABZ encoder card is plugged in slot B or slot C or slot D port.	Plug the ABZ encoder card in slot A port.
149	FS Card Plug Slot Error	Card Plug Slot Error	Configurable	Fault	20482	0xA065	FS card is plugged in slot A or slot C or slot D port.	Plug the FS card in slot B port.
150	Fiber Card Plug Slot Error	Card Plug Slot Error	Configurable	Fault	20483	0xA066	Fiber card is plugged in slot A or slot B or slot D port.	Plug the Fiber card in slot C port.
151	ProfiNet Card Plug Slot Error	Card Plug Slot Error	Configurable	Fault	20484	0xA067	Profinet card is plugged in slot A or slot B or slot C port.	Plug the Profinet card in slot D port.
152	EIP Card Plug Slot Error	Card Plug Slot Error	Configurable	Fault	20485	0xA068	Dual port EIP card is plugged in slot A or slot B or slot C port.	Plug the dual port EIP card in slot D port.
153	MCU STO 5V Power Fault	STO Power Fault	Fault		21667	0xA069	Control board 5V power is < 4.8 V or > 5.2 V.	Please contact the nearest distributor.
154	DSP STO 5V Power Fault	STO Power Fault	Fault		21668	0xA070	Control board 5V power is < 4.8 V or > 5.2 V.	Please contact the nearest distributor.
156	M/F Configure Error	M/F Configure Error	Fault		34563	0xA072	Master/follower synchronous mode does not match with motor control mode.	Check the synchronous mode and motor control mode setting.
157	FC SPI Comm Fault	FC SPI Comm Fault	Fault		22052	0xA073	Communication bus for Fast channel is damaged.	Check the Port D pin connection.
158	FC Version MisMatch	FC Version MisMatch	Fault		25377	0xA074	Fast channel packet format mismatched.	Update drive with appropriate bundle.
159	Encoder1 Signal Missing	Encoder1 Signal Missing	Fault		41334	0xA075	1) The encoder is damaged. 2) Phase A is disconnect.	Check the wiring of encoder signal.
160	Encoder2 Signal Missing	Encoder2 Signal Missing	Fault		41335	0xA076	1) The encoder is damaged. 2) Phase A is disconnect.	Check the wiring of encoder signal.
161	Encoder1 Inverse	Encoder1 Inverse	Fault		41336	0xA077	1) Encoder1 A+ and A- are both high or low, B+ and B- are both high or low. 2) The use of environmental interference is large.	• Check the wiring • Check whether the three-phase output line of the motor crosses the signal line of the encoder

Table 53. PowerXL DX1 fault code list, continued

Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
162	Encoder2 Inverse	Encoder2 Inverse	Fault		41337	0xA078	1) Encoder2 A+ and A- are both high or low, B+ and B- are both high or low. 2) The use of environmental interference is large	• Check the wiring • Whether the three-phase output line of the motor crosses the signal line of the encoder
163	ABZ Card Vcc Error	ABZ Card Vcc Error	Fault		41333	0xA079	• Encoder power switch error • ABZ card is damaged	• Check the encoder power switch • Replace the ABZ card
164	ABZ Card Dcom Error	ABZ Card Dcom Error	Fault		41233	0xA07A	Hardware error or ABZ card not plug in.	Check that the board is securely installed.
165	Motor Direction Error	Motor Direction Error	Warning		21123	0xA07B	1) Three-phase output sequence is incorrect. 2) Encoder feedback signal.	• Change output phase • Swap encoder A/B signal
167	M/F Comm Lost Fault	M/F Comm Lost Fault	Configurable	Fault	61697	0xA056	Communication is lost between Master and Follower.	Check the fiber cable connections
168	Follower Error	Follower Error	Configurable	Fault	61696	0xA057	Follower is not ready.	Check follower drive status.
169	SD upgrading failed	SD upgrading failed	Warning		NA	NA	SD wire connection error, EMI etc.	Reconnect wire, clean environment for EMI, upgrade again.
200	FS CPU Diagnosis Error	The CPU logic test failure	Fault		21690	0xA07D	The CPU logic failure in the system.	Power cycle, if fault still exists, contact the nearest distributor.
201	FS RAM Diagnosis Error	The ECC SRAM test failure or meet uncorrectable error	Fault		21691	0xA07E	• The SRAM uncorrectable error occurs • SRAM test fail via MARCH13 algorithm	Power cycle, if fault still exists, contact the nearest distributor.
202	FS FLASH Diagnosis Error	Flash CRC check failure or ECC test failure	Fault		21692	0xA07F	• The flash uncorrectable error occurs • RC check fail due to incorrect program data	Power cycle, if fault still exists, contact the nearest distributor.
203	FS BUS Diagnosis Error	Program sequence is incorrect, or stack is out of range	Fault		21693	0xA080	• Program sequence error • Stack is over flow or under flow	Power cycle, if fault still exists, contact the nearest distributor.
205	FS Clock Diagnosis Error	FS_MCU clock frequency or another FS_MCU clock frequency is out of limit	Fault		21695	0xA082	• External crystal oscillator is broken • Clock configuration is incorrect	Power cycle, if fault still exists, contact the nearest distributor.
206	FS EEPROM Diagnosis Error	Write or read and write parameter fail	Fault		21696	0xA083	• Parameter CRC is incorrect • Read data from EEPROM failure • Write data to EEPROM failure	Write safety parameters in Safety Tool again, or do the factory reset and power cycle, if fault still exists, contact the nearest distributor.
207	FS SCI Diagnosis Error	Communication is lost between CB_ MCU and FS_MCU	Fault		21697	0xA084	• Connection is not stable • Communication cycle broken	Power off, make sure the connection is stable, power on again, if fault still exists, contact the nearest distributor.
208	FS FSI Diagnosis Error	Communication is lost between two FS_MCU	Fault		21698	0xA085	• Receive data is incorrect • Communication cycle broken	Power cycle, if fault still exists, contact the nearest distributor.
209	FS MCU ID Diagnosis Error	MCU identification pins error	Warning		21699	0xA086	MCU identification cycle broken during run time.	Power cycle, if fault still exists, contact the nearest distributor.
210	FS Watchdog Diagnosis Error	The execution time of interrupt or main task is out of limit	Fault		21700	0xA087	Software error, the execution time is out of limit.	Power cycle, if fault still exists, contact the nearest distributor.
211	FS Reset Circuit Diagnosis Error	FS_MCU reset unintendedly	Fault		21701	0xA088	• Software error caused watchdog timeout reset • Reset pin is forced to low	Power cycle, if fault still exists, contact the nearest distributor.
212	FS MCU1 Power Diagnosis Error1	The 1.2 V power supply for FS_MCU1 is undervoltage or overvoltage	Fault		21702	0xA089	Power supply circuit fault.	Power cycle, if fault still exists, contact the nearest distributor.
213	FS MCU1 Power Diagnosis Error2	The 3.3 V power supply for FS_MCU1 is undervoltage or overvoltage	Fault		21703	0xA08A	Power supply circuit fault.	Power cycle, if fault still exists, contact the nearest distributor.

Table 53. PowerXL DX1 fault code list, continued

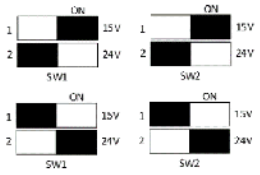
Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
214	FS MCU2 Power Diagnosis Error1	The 1.2 V power supply for FS_MCU1 is undervoltage or overvoltage	Fault		21704	0xA08B	Power supply circuit fault.	Power cycle, if fault still exists, contact the nearest distributor.
215	FS MCU2 Power Diagnosis Error2	The 3.3 V power supply for FS_MCU1 is undervoltage or overvoltage	Fault		21705	0xA08C	Power supply circuit fault.	Power cycle, if fault still exists, contact the nearest distributor.
216	FS SABZ 24V Diagnosis Error	The 24 V power supply for S-ABZ is out of range	Fault		21706	0xA08D	Power supply circuit fault.	Power cycle, if fault still exists, contact the nearest distributor.
217	FS SABZ 6V Diagnosis Error	The 6 V reference voltage for S-ABZ is out of range	Fault		21707	0xA08E	Power supply circuit fault.	Power cycle, if fault still exists, contact the nearest distributor.
218	FS SABZ 5V Diagnosis Error	The 5 V reference voltage for S-ABZ is out of range	Fault		21708	0xA08F	Power supply circuit fault.	Power cycle, if fault still exists, contact the nearest distributor.
219	FS SABZ Power Diagnosis Error	S-ABZ card encoder power configuration is incorrect, or power is out of range	Fault		21709	0xA090	• SW1 and SW2 of ABZ card configuration do not match • SW1 and SW2 are configured invalid power • Power supply circuit fault	SW1 and SW2 configuration must match, encoder power only supports 15 V and 24 V, the valid configuration is below.  Correct the configuration and power cycle, if fault still exists, contact the nearest distributor.
220	FS DI TP Diagnosis Error	DI self-diagnostic failure	Fault		21710	0xA091	Digital input circuit fault.	Power cycle, if fault still exists, contact the nearest distributor.
221	FS DI Crossing Diagnosis Error	DI status are not match	Fault		21711	0xA092	• The two digital inputs are the same • The time difference between two digital inputs is more than 300 ms • Digital input circuit fault	Ensure the two digital inputs are closed/open within 300 ms, power cycle, if fault still exists, contact the nearest distributor.
222	FS DO Diagnosis Error	DO self-diagnostic failure	Fault		21712	0xA093	Digital output circuit fault.	Power cycle, if fault still exists, contact the nearest distributor.
223	FS DO Crossing Diagnosis Error	DO status are not match between two MCUs	Fault		21713	0xA094	• Software error • Digital output circuit fault	Power cycle, if fault still exists, contact the nearest distributor.
224	FS Speed Self Diagnosis Error	Speed self-diagnostic failure	Fault		21714	0xA095	• AB signal duty cycle is out of range • AB signal is missing	Check A/B signals.
225	FS Speed Crossing Diagnosis Error	Speed cross-diagnostic failure	Fault		21715	0xA096	The frequency of A signal and B signal are not the same.	Check A/B signals.
226	FS Direction Self Diagnosis Error	Direction self-diagnostic failure	Fault		21716	0xA097	AB signal phase error.	Check A/B signals.
227	FS Direction Crossing Diagnosis Error	Direction cross-diagnostic failure	Fault		21717	0xA098	The direction on FS_MCU1 and FS_MCU2 is not the same.	Check A/B signals.
228	FS Position Diagnosis Error	Relative position diagnostic failure	Fault		21718	0xA099	The relative position on FS_MCU1 and FS_MCU2 is not the same.	Check A/B signals.
229	FS Parameter Diagnosis Error	The parameters value is not the same between FS_MCU1 and FS_MCU2	Fault		21719	0xA09A	Setting parameter failure on one MCU.	Use safety tool and check which parameter is not the same between FS_MCU1 and FS_MCU2, then re-write that parameter, or do factory reset to reset all parameters to default value.

Table 53. PowerXL DX1 fault code list, continued

Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
230	SS1 Over Time	Use SS1-t, motor deceleration time is too long	Fault		21671	0xA09B	The motor does not reduce to zero speed within the activation SS1-t function delay time.	Check the FS card parameter settings. • Required parameter "t-delay STO@SS1" > Motor deceleration time. • Motor deceleration time is calculated based on the parameters "Speed scaling" and "Ramp time to zero"
231	SS1 Speed Exceed Tolerance	Use SS1-r, the speed changes greatly during deceleration	Fault		21673	0xA09C	After activating the SS1-r function, the speed change during motor deceleration is greater than the parameter "Deceleration tolerance".	• Monitor motor speed change • According to the actual deceleration of the motor, set the parameter "Deceleration tolerance"
232	SBC Relay Feedback Error	SBC relay feedback failure	Fault		21674	0xA09D	• Relay is broken • Connection is lost between relay and the card	Check SBC safety relay and connection.
233	SBC Relay Feedback Warning	SBC relay feedback failure	Warning		21675	0xA09E	• Relay is broken • Connection is lost between relay and the card	Check SBC safety relay and connection.
234	SLS Over Time	Use SLS-t, motor deceleration time is too long	Fault		21676	0xA09F	The motor does not reduce to zero speed within the activation SLS-t function delay time.	• Check the FS card parameter settings • Required parameter "SLS-t delay" > Motor deceleration time. • Motor deceleration time is calculated based on the parameters "Speed scaling" and "Ramp time to zero"
235	SLS Speed Exceed Tolerance	Use SLS-r, the speed changes greatly during deceleration	Fault		21677	0xA0A0	After activating the SLS-r function, the speed change during motor deceleration is greater than the parameter "Deceleration tolerance."	• Monitor motor speed change • According to the actual deceleration of the motor, set the parameter "Deceleration tolerance"
236	SLS Trip Limit	Use SLS, the motor speed is not limited and exceeds the trip limit value.	Fault		21678	0xA0A1	After activating the SLS function, the motor speed is uncontrolled and exceeds the trip limit value.	• Check the cause of motor speed change • Check the FS card parameter settings. Required parameter "SLS trip limit" > "SLS limit"
237	SOS Position Exceed Tolerance	Use SOS, displacement occurs when the motor is stationary	Fault		21679	0xA0A2	After activating the SOS function, the motor deviation of the stop position exceeds the defined standstill tolerance.	• Check the cause of motor stop position change • Required stop position change < parameter "SOS n=0-Hysteresis"
238	SS2 Over Time	Use SS2-t, motor deceleration time is too long	Fault		21680	0xA0A3	The motor does not reduce to zero speed within the activation SS2-t function delay time.	• Check the FS card parameter settings • Required parameter "t-delay STO@SS2" > Motor deceleration time • Motor deceleration time is calculated based on the parameters "Speed scaling" and "Ramp time to zero"
239	SS2 Speed Exceed Tolerance	Use SS2-r, the speed changes greatly during deceleration	Fault		21681	0xA0A4	After activating the SS2-r function, the speed change during motor deceleration is greater than the parameter "Deceleration tolerance".	• Monitor motor speed change • According to the actual deceleration of the motor, set the parameter "Deceleration tolerance"
240	SS2 Position Exceed Tolerance	Use SS2, displacement occurs when the motor is stationary	Fault		21682	0xA0A5	After activating the SS2 function, the motor deviation of the stop position exceeds the defined standstill tolerance.	• Check the cause of motor stop position change • Required stop position change < parameter "SOS n=0-Hysteresis"

Table 53. PowerXL DX1 fault code list, continued

Fault code	Fault name	Fault description	Fault type	Default config	Profi code	CIP code	Possible cause	Remedy
241	SDI Over Time	Use SDI-t, motor deceleration time is too long	Fault		21683	0xA0A6	The motor does not reduce to zero speed within the activation SDI-t function delay time.	• Check the FS card parameter settings • Required parameter "SDI-t delay" > Motor deceleration time • Motor deceleration time is calculated based on the parameters "Speed scaling" and "Ramp time to zero"
242	SDI Speed Exceed Tolerance	Use SDI-r, the speed changes greatly during deceleration	Fault		21684	0xA0A7	After activating the SDI-r function, the speed change during motor deceleration is greater than the parameter "Deceleration tolerance".	• Monitor motor speed change • According to the actual deceleration of the motor, set the parameter "Deceleration tolerance"
243	SDI Position Exceed Tolerance	Use SDI, displacement occurs when the motor is stationary	Fault		21685	0xA0A8	After activating the SDI function, the motor rotates to the forbidden direction and exceeds the allowable degree of the SDI tolerance limit.	• Check the cause of motor rotating to the forbidden direction change • Required rotates to the forbidden direction change < parameter "SDI Limit degree"
244	SLA Acceleration Exceed Tolerance	Use SLA, the motor accelerates/ deceleration too fast	Fault		21686	0xA0A9	After activating the SLA function, the motor acceleration/deceleration exceeds the trip limit.	• Check acceleration/ deceleration time • According to the actual acceleration/deceleration of the motor, set the parameter "SLA+ trip limit"/"SLA- trip limit"
245	SSR Speed Exceed Tolerance	Use SSR, the motor speed exceeds the monitoring range	Fault		21687	0xA0AA	After activating the SSR function, the motor speed exceeds the monitoring range.	Check whether the motor speed is between the parameters "SSR upper limit" and "SSR lower limit".
246	FS MCU ID Diagnosis Error	MCU identification pins error	Fault		21688	0xA0AB	MCU identification cycle broken during power on.	Power cycle, if fault still exists, contact the distributor near you
247	SABZ Tick Diagnosis Error	ABZ tick diagnosis error	Fault		41338	0xA0AC	• Communication is disconnected due to automatic upgrade, factory reset or card not inserted properly. (between SABZ card and CB_MCU or between FS card and CB_MCU) • SABZ power supply diagnostic function is abnormal	• Check card connectivity • Power cycle, if fault still exists, contact the nearest distributor
248	Encoder Line Number Fault	Encoder Line Number Fault	Fault		NA	0xA0AD	Encoder1 pulse count or Encoder2 pulse count value error	Check the encoder's instruction manual and use the correct number of pulses.
249	Safety Card Configuration Error	Safety card configuration is error	Fault		NA	0xA0AE	• The drive is configured as no safety card, but safety card is on board • The drive is configured as safety card and SABZ card, but safety card or SABZ card is not on board	• Check the Settings of "safety card Configuration" parameter • Power cycle, if fault still exists, contact the nearest distributor
250	Safety Card Over Temp	The temperature of the FS card chip is too high	Fault		NA	0xA0AF	FS card chip temperature greater than 120°.	• Stop run driver and wait for the temperature to drop. • Power cycle, if fault still exists, contact the nearest distributor

Note: Configurable—Faults that are specified as "Configurable" have "Fault configuration parameter" associated with them. This configuration parameter can be configured as using keypad (menu Protections) or using vendor specific object.

Appendix D—PowerXL recommended secure hardening guidelines

Introduction

EATON PRODUCT SECURE CONFIGURATION GUIDELINES

Documentation to securely deploy and configure Eaton products

PowerXL DX1 has been designed with cybersecurity as an important consideration. A number of features are offered in the product to address cybersecurity risks. These Cybersecurity Recommendations provide information to help users to deploy and maintain the product in a manner that minimizes the cybersecurity risks. These Cybersecurity Recommendations are not intended to provide a comprehensive guide to cybersecurity, but rather to complement customers' existing cybersecurity programs.

Eaton is committed to minimizing the cybersecurity risk in its products and deploying cybersecurity best practices in its products and solutions, making them more secure, reliable, competitive for customers.

Table 54. PowerXL—secure configuration guidelines

Category	Description
[1] Intended Use & Deployment Context	PowerXL DX1 drive is a high-performance variable frequency drive to replace the legacy/branded SPX platform. The program will include closed loop control, SIL3 rated functional safety, precise speed / torque / positioning control and accommodate multiple encoder types and fieldbus comms through option cards.
[2] Asset Management	Keeping track of all the devices in the system is a pre-requisite for effective management of Cybersecurity of a system. Ensure you maintain an inventory of all the components in your system in a manner in which you uniquely identify each component. To facilitate this DX1 supports the following identifying information - manufacturer, type, serial number, f/w version number, and location. Customers/users can read following information from product label • Model Number • Serial Number • DX1 Information specific to communication protocols is available form parameter menu as below • IP Address Mode (P96.5.1) • Active IP Address (P96.5.2) • MAC Address (P96.5.5) Information specific to the dual communication port option cards are available from the parameter menu as below • IP Address Mode (Slot D – B38.1.2.2) • Active IP address (Slot D – B38.1.1.6) • MAC address (Slot D – B38.1.1.5) • Station Name (Slot D – B38.1.2.6)

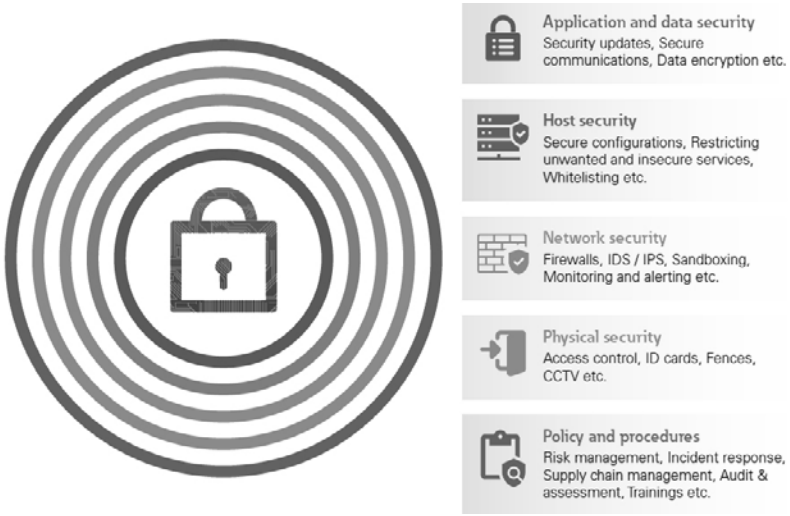


Table 54. PowerXL—secure configuration guidelines, continued

Category	Description
[3] Defense in Depth	Defense in Depth basically means applying multiple counter-measures for mitigating risks, in a layered or step wise manner. A layered approach to security as shown in the below diagram is what is recommended. Defense in Depth is the responsibility of both the manufacturer and the customer.
[4] Risk Assessment	Eaton recommends conducting a risk assessment to identify and assess reasonably foreseeable internal and external risks to the confidentiality, availability and integrity of the system | device and its environment. This exercise should be conducted in accordance with applicable technical and regulatory frameworks such as IEC 62443 and NERC-CIP. The risk assessment should be repeated periodically.

[5] Physical Security	An attacker with unauthorized physical access can cause serious disruption to system/device functionality. Additionally, Industrial Control Protocols don't offer cryptographic protections, making ICS and SCADA communications especially vulnerable to threats to their confidentiality. Physical security is an important layer of defense in such cases. PowerXL DX1 is designed to be deployed and operated in a physically secure location. Following are some best practices that Eaton recommends to physically secure your system/device:
	• Secure the facility and equipment rooms or closets with access control mechanisms such as locks, entry card readers, guards, man traps, CCTV, etc. as appropriate.
	• Restrict physical access to cabinets and/or enclosures containing PowerXL DX1 and the associated system. Monitor and log the access at all times.
	• Physical access to the telecommunication lines and network cabling should be restricted to protect against attempts to intercept or sabotage communications. It's a best practice to use metal conduits for the network cabling running between equipment cabinets.
	• PowerXL DX1 supports the following physical access ports.
	  • RJ45 connector for removable keypad as well as Modbus RTU communications
	  • RJ45 for Modbus TCP communications
	  • Terminal block for Modbus RTU and other Digital IOs
	  • RJ45 for PROFINET communication available on PROFINET Communication card.
	  • RJ45 for dual port EtherNet IP communication available on dual port Communication card.
	  • 4 option card slots
	  • SD Card slot
	Access to these ports should be restricted.
	• Do not connect removable media (e.g., USB devices, SD cards, etc.) for any operation (e.g., firmware upgrade, configuration change, or boot application change) unless the origin of the media is known and trusted.
	• Before connecting any portable device through a USB port or SD card slot, scan the device for malware and viruses.

[6] COTS Platform Security	Eaton recommends that customers harden third-party commercial off-the-shelf (COTS) operating systems or platforms that are used to run Eaton applications / products (e.g., third party hardware, operating systems and hypervisors, such as those made available by Dell, Microsoft, VMware, Cisco, etc.). • Eaton recommends that customers refer to the COTS vendor's documentation for guidance on how to harden these components. • Vendor-neutral guidance is made available by the Center for Internet Security https://www.cisecurity.org/ Irrespective of the platform, customers should consider the following best practices: • Install all security updates made available by the COTS manufacturer. • Change default credentials upon first login. • Disable or lock unused built-in accounts. • Limit use of privileged generic accounts (e.g., disable interactive login). • Change default SNMP community strings. • Restrict SNMP access using access control lists. • Disable unneeded ports & services. Power Xpert inControl Software: • This PC Tool software implements the obfuscation of all the binaries and third-party libraries used for the development. Latest versions of third-party libraries are used with security updates.

Table 54. PowerXL—secure configuration guidelines, continued

Category	Description

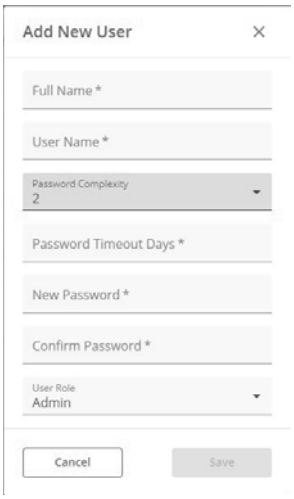
[7] Account Management	Logical access to the system | device should be restricted to legitimate users, who should be assigned only the privileges necessary to complete their job roles/functions. Some of the following best practices may need to be implemented by incorporating them into the organization's written policies:
	Eaton Recommends
	• Ensure default credentials are changed upon first login PowerXL DX1 should not be deployed in production environments with default credentials, as default credentials are publicly known.
	• No account sharing – Each user should be provided with a unique account instead of sharing accounts and passwords. Security monitoring/logging features in the product are designed based on each user having a unique account. Allowing users to share credentials weakens security.
	• Restrict administrative privileges - Attackers seek to gain control of legitimate credentials, especially those for highly privileged accounts. Administrative privileges should be assigned only to accounts specifically designated for administrative duties and not for regular use.
	• Leverage the roles / access privileges Admin, Operator, Engineer, Viewer to provide tiered access to the users as per the business /operational need. Follow the principle of least privilege (allocate the minimum authority level and access to system resources required for the role).
	• Perform periodic account maintenance (remove unused accounts).
	• Ensure password length, complexity and expiration requirements are appropriately set, particularly for all administrative accounts (e.g., minimum 10 characters, mix of upper- and lower-case and special characters, and expire every 90 days, or otherwise in accordance with your organization's policies).
	• Password should meet at least 3 out of the following 4 complex rules
	  • at least 10 characters
	  • at least 1 uppercase character (A-Z)
	  • at least 1 lowercase character (a-z)
	  • at least 1 digit (0-9)
	  • at least 1 special character (punctuation) — do not forget to treat space as special characters too
	• Enforce session time-out after a period of inactivity.
	Web Server Account Management Available on PowerXL DX1
	Initial login on web server interface
	Username: admin
	Default Password: Admin*1
	Users shall be required to change default password upon first login
	PowerXL DX1 User Management
	PowerXL DX1 supports the creation of up to 5 different user accounts for the web server interface.
	 
	
	• When configuring user accounts on web server-Settings-User Management- Add New User page, PowerXL DX1 provides 4 different user access levels
	  • Admin – Can perform parameter configuration, new user creation/deletion, Password reset.
	  • Operator - Can perform parameter configuration. Access to motor control
	  • Engineer - Can perform parameter configuration but cannot access motor related parameters.
	  • Viewer – Can only view parameters.

Table 54. PowerXL—secure configuration guidelines, continued

Category	Description

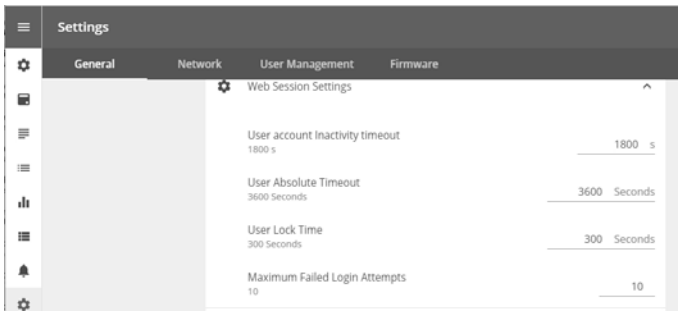
	PowerXL DX1 Password Management
	• When configuring user accounts on web server-Settings-User Management- Add New User page, PowerXL DX1 provides 4 levels of passwords complexities for the administrator to choose. Eaton recommends new accounts be set to password level 2 complexity.
	• Password complexity level – 0
	  • It should be at least 6 characters long
	  • It should not match with user name or full name
	  • It should not match with existing password
	• Password complexity level – 1
	  • It should be at least 8 characters long
	  • It should not match with user name or full name
	  • It should not match with existing password
	  • It should contain at least 1 alphabetic and 1 numeric character
	• Password complexity level – 2
	  • It should be at least 12 characters long
	  • It should not match with user name or full name
	  • It should not match with existing password
	  • It should contain at least 1 alphabetic and 1 numeric character
	  • It should contain at least 1 special character
	  • It should contain at least 1 upper case alphabetic character
	• Password complexity level – 3
	  • It should be at least 16 characters long
	  • It should not match with user name or full name
	  • It should not match with existing password
	  • It should contain at least 2 alphabetic characters and 1 numeric character
	  • It should contain at least 2 special characters
	  • It should contain at least 1 upper case alphabetic character
	  • It should contain at least 1 lower case alphabetic character
	• PowerXL DX1 provides the ability to set password timeout values for each individual web server user account. Timeout values can range from 0 days to 35535 days. 0 days – no timeout
	
	PowerXL DX1 Session Management
	• By default, max retry attempt for login fail is 10, but this can be changed by the Admin user by changing value of parameter "Maximum Failed Login Attempts" on Settings->General tab. After the max login failed attempts, the user will be locked out for a time specified in parameter "User Lock Time". This parameter can also be changed on Settings->General tab.
	• PowerXL DX1 does not support multiple sessions of a single user, multiple sessions are disabled.
	• PowerXL DX1 supports inactivity timeout and absolute timeout for logged in User. This can also be configured from the Settings->General tab with parameters "User Absolute Timeout" & "User account inactivity timeout".
	1. A session will automatically expire if its inactivity time is greater than "User account inactivity timeout".
	2. A session will automatically expire after the "User Absolute Timeout".
	 
	
	• User Account Inactivity Timeout
	  • Default – 1800 seconds
	• User Absolute Timeout
	  • Default – 3600 seconds
	• User Lock Time
	  • Default – 300 seconds
	• Max Failed Login Attempts
	  • Default – 10 attempts

Table 54. PowerXL—secure configuration guidelines, continued

Category	Description
	Keypad User Management Available on PowerXL DX1
	• PowerXL DX1 provides the ability to set 3 different access levels on the local keypad. • P32.1 User Access Level - Installer – Full user access. - Operator – Access to motor control; No configuration. - Observer – View only. • P32.2 Operator Level Password - Default – no password - Up to 16 alphanumeric characters • P32.3 Installer Level Password - Default – no password - Up to 16 alphanumeric characters • P32.5 User Access Level Password Timeout - 0-Upon change (default) - 1-10minutes - 2-30minutes • P32.6 User Access Level Logout - 0-No, will remain at current access level once logged in(default) - 1-Yes, logout to Observer access • When Operator/Installer password is set • User can monitor parameters value "Observer" access. Users are required to enter the appropriate password to advance to either Operator or Installer access.. • User are required to enter the current password before being allowed to change either Operator or Installer level passwords. • The Power Xpert inControl Software tool shares the user management with the keypad: • Follows same user management as keypad. • PowerXL DX1 provides the ability to select which parameters are displayed on the keypad. Using the Power Xpert inControl tool, critical parameters can be "hidden" from display on the keypad, such as IP addresses and so on. • PowerXL DX1 Motor Running Lock – To enhance motor security, motor control parameters can only be modified when the motor is in the stop mode. Affected parameters are listed in the PowerXL DX1 application manual.

Table 54. PowerXL—secure configuration guidelines, continued

Category	Description

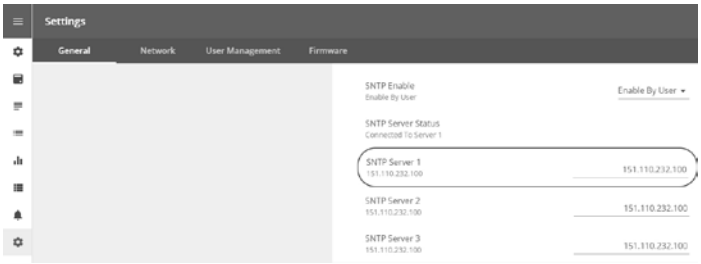
[8] Time Synchronization	Many operations in power grids and IT networks heavily depend on precise timing information.
	Ensure the system clock is synchronized with an authoritative time source (using manual configuration, NTP, SNTP, or IEEE 1588).
	PowerXL DX1 Real Time Clock
	The PowerXL DX1 Real Time Clock can be set manually by the user and provides accurate timekeeping. The PowerXL DX1 Real Time Clock has battery backup, which provides the DX1 with continuous timekeeping even when power is removed from the drive.
	P99.3.1 Real Time Clock
	P99.3.2 Daylight Saving
	P99.3.3 RTC Battery Status
	P99.3.4 Drive Time Offset
	PowerXL DX1 SNTP
	 
	The SNTP is Simple Network Time Protocol, which is a subset of the Network Time Protocol (NTP) used to synchronize computer clocks in the Internet.
	PowerXL DX1 will act as SNTP client and operate in SNTP unicast mode. SNTP uses UDP port 123. Host will act as SNTP server and operate in SNTP Broadcast mode. In unicast mode, the client sends a request (NTP mode 3) to a designated unicast server and expects a reply (NTP mode 4) from that server. Option to configure up to three different NTP servers.
	• Update Time(Configurable): 15sec to 24hrs. PowerXL DX1 will send request to the SNTP server every Update Time
	• Retry Time(Configurable): If no or invalid response from any server then the PowerXL DX1 will retry after retry Time. The retry time is incremental. Initial value of Retry_Time is configured by user.
	• Retry Mechanism:
	  • If first server does not respond then PowerXL DX1 SNTP service sends request to next server.
	  • If any of the servers responds back then Retry_Time is reset.
	  • If no server responds (one round complete by requesting all 3 servers) then Retry_Time will increase exponentially.
	• Maximum exponential rise is 10 times of base Retry_Time.
	  • e.g. 3 sec > 6 > 12 > 24 > 30 sec (Max)
	• Min/Max range of Retry_Time : 3 sec to 20 sec
	• Maximum_Retry_Time will be 10 times of Retry_Time which is configured by user.
	• The PowerXL DX1 SNTP client reinitializes and synchronizes with server in below events:
	  • Product power up / reset.
	  • SNTP server n target change when client is already connected to server n.
	  • When Update Time or Retry_Time.value changes

Table 54. PowerXL—secure configuration guidelines, continued

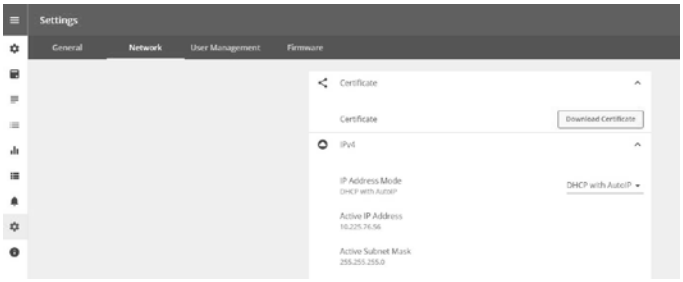
Category	Description
[9] Network Security	PowerXL DX1 supports network communication with other devices in the environment. This capability can present risks if it's not configured securely. Following are Eaton recommended best practices to help secure the network. Additional information about various network protection strategies is available in Eaton Cybersecurity Considerations for Electrical Distribution Systems [R1]. Eaton Cybersecurity Considerations for Electrical Distribution Systems Eaton recommends segmentation of networks into logical enclaves, denying traffic between segments except that which is specifically allowed, and restricting communication to host-to-host paths (for example, using router ACLs and firewall rules). This helps to protect sensitive information and critical services and creates additional barriers in the event of a network perimeter breach. At a minimum, a utility Industrial Control Systems network should be segmented into a three-tiered architecture (as recommended by NIST SP 800-82[R3]) for better security control. Communication Protection: PowerXL DX1 uses AES-128 encryption for its network communications. PowerXL DX1 has TLS 1.2 configured. HTTPS is enabled by default. Self-signed CA certificate is used for HTTPS. Users need to download CA certificate from webserver and install it in browser.  Eaton recommends enabling only those ports that are required for operations and protect the network communication using network protection systems like firewalls and intrusion detection systems / intrusion prevention systems. Use the information below to configure your firewall rules to allow access needed for PowerXL DX1 to operate smoothly. PowerXL DX1 Supported Ports and Services **Port Service** / **Port No.** / **Default** HTTPS / 443 / enabled HTTP / 80 / disabled DHCP / 68 / disabled SNTP / 123 / disabled Modbus TCP / 502 / disabled MQTT / 8883 / disabled MQTT over web sockets / 443 / disabled EtherNet/IP TCP / 44818 / enabled when present EtherNet/IP UDP / 2222 / enabled when present ProfiNet UDP / 34964 / enabled when present • PowerXL DX1 IP Whitelisting can be used to further limit access. P96.6.2 Trusted IP Whitelist P96.6.4 Modbus TCP Trusted IP Enable (default – enabled) User must configure the requisite IP address in the list. IP Whitelist can be configured using WebUI or Keypad. Access to the device will be limited to only those IP addresses configured in the IP Whitelist. **Note:** As per PROFIBUS international – Governing body of PROFINET Specification, it's not possible to implement an IP whitelist. They recommend implementing Security at network level.and intrusion detection systems / intrusion prevention systems. • PowerXL DX1 RS485 Serial • Modbus RTU protocol on RS485 physical layer – enabled by default • PowerXL DX1 Bluetooth P96.7.1 Bluetooth Enable (default – disabled) P96.7.2 Bluetooth Broadcast Mode (default – off) P96.7.3 Bluetooth Painting Reset P96.7.4 Bluetooth Connect Status • PowerXL DX1 IoT P96.8.1 IOT Enable (default – disabled) P96.8.2 IOT Connection Status P96.8.4 Proxy Enable (default – disabled) All the protocols have dedicated menu structure. See User's Manual for details on how to activate and configure them.

Table 54. PowerXL—secure configuration guidelines, continued

Category	Description
[10] Remote Access	Remote access to devices/systems creates another entry point into the network. Strict management and validation of termination of such access is vital for maintaining control over overall ICS security. • The PowerXL DX1 provides the following access monitoring on its web server interface • User Account Inactivity Timeout: User is automatically logged out if inactive and Inactivity Timeout expires - Default – 1800 seconds • User Absolute Timeout: User is automatically logged out after Absolute Time expires regardless of activity - Default – 3600 seconds • Max Failed Login Attempts: Number of failed log in attempts allowed before user account is "locked" - Default – 10 attempts • User Lock Time: Amount of time user account will be locked if log in attempts are exceeded - Default – 300 seconds • IoT Connection
[11] Logging and Event Management	• Eaton recommends logging all relevant system and application events, including all administrative and maintenance activities. • Logs should be protected from tampering and other risks to their integrity (for example, by restricting permissions to access and modify logs, transmitting logs to a security information and event management system, etc.). • Ensure that logs are retained for a reasonable and appropriate length of time. • Review the logs regularly. The frequency of review should be reasonable, taking into account the sensitivity and criticality of the system | device and any data it processes. • PowerXL DX1 provides the following 7 types of logs, 1. Fault History 2. Fault/Warning Log 3. Parameter Change Log 4. Audit Power Log 5. Audit User Log 6. Audit Firmware Upgrade Log 7. Audit Configuration Log • PowerXL DX1 provides the ability to export log entries to a cvs file. • This PC Tool software has feature of logging user Audit Trails, error messages and monitor messages. • The access to generated audit log files and location change of audit log files is restricted to administrator user only.
[12] Vulnerability Scanning	It is possible to install and use third-party software with PowerXL DX1. Any known critical or high severity vulnerabilities on third party component/libraries used to run software /applications should be remediated before putting the device | system into production. • Eaton recommends running a vulnerability scan to identify known vulnerabilities for software used with the product. For COTS components (e.g., applications running on Windows), vulnerabilities can be tracked on the National Vulnerability Database (NVD), available at https://nvd.nist.gov/. • Keep software updated by monitoring security patches made available by COTS vendors and installing them as soon as possible. • PowerXL DX1 Software BOM can be found in LINK **Note:** Many compliance frameworks and security best practices require a monthly vulnerability review. For many non-COTS products vulnerabilities will be communicated directly through the vendor site.
[15] Malware Defenses	Eaton recommends deploying adequate malware defenses to protect the product or the platforms used to run the Eaton product.
[16] Secure Maintenance	**Best Practices** Update device firmware prior to putting the device into production. Thereafter, apply firmware updates and software patches regularly. Eaton publishes patches and updates for its products to protect them against vulnerabilities that are discovered. Eaton encourages customers to maintain a consistent process to promptly monitor for and install new firmware updates. PowerXL DX1 firmware upgrades are done through TRC calls only and service engineers. Please check Eaton's cybersecurity website for information bulletins about available firmware and software updates.

Table 54. PowerXL—secure configuration guidelines, continued

Category	Description
[17] Business Continuity / Cybersecurity Disaster Recovery	**Plan for Business Continuity / Cybersecurity Disaster Recovery** Eaton recommends incorporating PowerXL DX1 into the organization's business continuity and disaster recovery plans. Organizations should establish a Business Continuity Plan and a Disaster Recovery Plan and should periodically review and, where possible, exercise these plans. As part of the plan, important system | device data should be backed up and securely stored, including: • Updated firmware for PowerXL DX1. Make it a part of standard operating procedure to update the backup copy as soon as the latest firmware is updated. • Backup the current configuration. • Documentation of the current permissions / access controls, if not backed up as part of the configuration.
[18] Customer Application Security	PowerXL DX1 provides a platform on which customers can customize and host applications according to their requirements. Security vulnerabilities in these applications may expose the underlying device to attack. Eaton recommends observing best practices for secure system development when customers develop and host an application on the device: • Privacy and Security by Design: The application should take security and privacy into consideration from the outset, including at the stage of defining requirements and assessing the associated risks. • Communication Protection: If the application communicates over the network, Eaton recommends encrypting the communications in accordance with the applicable level described by the FIPS 140-2 standard. • Access Enforcement: The application should provide the ability to enforce access controls to protect the application against unauthorized access and to protect accounts against unauthorized authentication attempts (for example, through account lockout). • Least Privilege: Any application developed by the customers should not run with root account privileges. The root account has full control over and access to the operating system. Therefore, if an application that requires root privileges has any security vulnerability, it endangers the entire system. • Input Checking: All input to the application should be sanitized before storing and processing by the application to protect against malicious code injection. • Output Handling: Data output by the application for user consumption, including error messages, should be appropriately handled to avoid revealing important information about the application and the underlying system. • Password Management: The application should securely store and transmit credentials (for example, encrypting authentication traffic, and salting and hashing passwords in transit and at rest). Password complexity should be implemented, and password should be masked when entered on-screen. • Secure Coding Practices: Follow secure coding practice while developing applications for the device (for example, implementing multiple security layers, verifying authorization for all requests, conducting code reviews, etc.). • Administration Interface: The interface for administering the application should be separated from the end-user interface. • Session Controls: All application sessions should be encrypted, logged and monitored. • Event Log Generation: The application should have the capability to log security related events at a minimum, including the time, date, and user.
[19] Sensitive Information Disclosure	Eaton recommends that sensitive information (i.e., connectivity, log data, personal information) that may be stored by PowerXL DX1 be adequately protected through the deployment of organizational security practices. PowerXL DX1 treats the following as sensitive data. 1. All web user passwords 2. Proxy password 3. IoT Connection String PowerXL DX1 encrypts the above data before being saved to NVRAM

Table 54. PowerXL—secure configuration guidelines, continued

Category	Description
[20] Decommissioning or Zeroization	It is a best practice to purge data before disposing of any device containing data. Guidelines for decommissioning are provided in NIST SP 800-88. Eaton recommends that products containing embedded flash memory be securely destroyed to ensure data is unrecoverable.

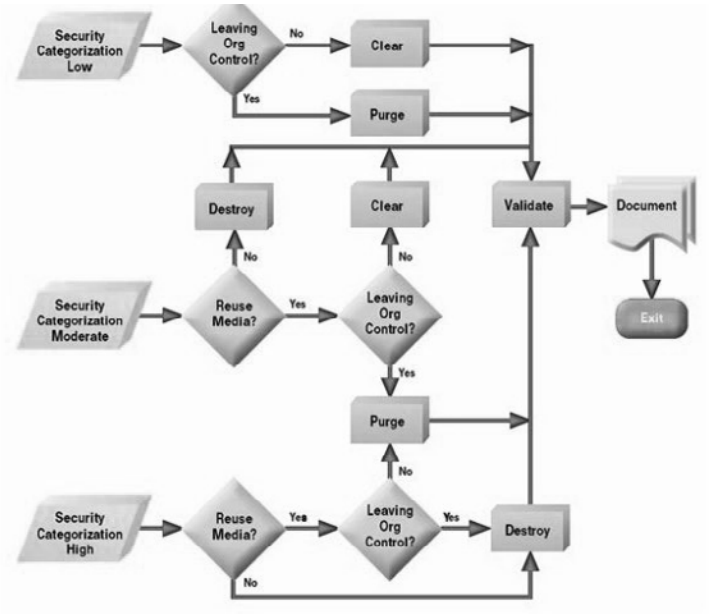


Figure 4-1: Sanitization and Disposition Decision Flow

Figure and data from NIST SP800-88

- Embedded Flash Memory on Boards and Devices
- Eaton recommends the following methods for disposing of motherboards, peripheral cards such as network adapters, or any other adapter containing non-volatile flash memory.
- Clear: If supported by the device, reset the state to original factory settings. PowerXL DX1 can perform factory reset using Webserver and Keypad.
  - Webserver: Settings->General->Device actions->REST Reset command->Factory Reset.
  - Keypad: Press Back Reset and OFF button simultaneously for 10 sec.
- Purge: If the flash memory can be easily identified and removed from the board, the flash memory may be destroyed independently of the board that contained the flash memory. Otherwise, the whole board would be destroyed. For this PowerXL DX1 main control unit (MCU) should be destroyed completely.
- Destroy: Shred, disintegrate, pulverize, or incinerate by burning the device in a licensed incinerator.

References

[R1] Cybersecurity Considerations for Electrical Distribution Systems (WP152002EN):
https://www.eaton.com/content/dam/eaton/products/industrialcontrols-drives-automation-sensors/c441-motor-insight-motor-protection-relays/cyber-security-white-paper-wp152002en.pdf

[R2] Cybersecurity Best Practices Checklist Reminder (WP910003EN):
https://www.eaton.com/content/dam/eaton/company/news-insights/cybersecurity/white-papers/WP910003EN.pdf

[R3] NIST SP 800-82 Rev 2, Guide to Industrial Control Systems (ICS) Security, May 2015:
https://nvlpubs.nist.gov/nistpubs/specialpublications/nist.sp.800-82r2.pdf

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