PowerXL Series VFD

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Communication manual

EATON
Powering Business Worldwide

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Cover Photo: Eaton PowerXL® Series Drives

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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
- 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:
  - Other independent devices for monitoring safety-related variables (speed, travel, end positions, and so on)
  - Electrical or non-electrical system-wide measures (electrical or mechanical interlocks)
  - 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!

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

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

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

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 mm2 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.

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.

Sécurité

AVERTISSEMENT !
TENSION ÉLECTRIQUE DANGEREUSE !

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.

AVERTISSEMENT

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'entraînement, 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'entraînement, 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 Series Overview

This series overview describes the purpose and contents of this manual, the receiving inspection recommendations and the PowerXL Series Open Drive 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 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 Series VFD. Keep this operating manual handy and distribute to all users, technicians and maintenance personnel for reference.

Receiving and inspection

The PowerXL 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 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 Eaton Electrical representative.

Note: Do not destroy the packing. The template printed on the protective cardboard can be used for marking the mounting points of the PowerXL VFD on the wall or in a cabinet.

Real time clock battery activation

To activate the real time clock (RTC) functionality in the PowerXL Series VFD, the RTC battery (already mounted in the drive) must be connected to the control board.

Simply remove the primary drive cover, locate the RTC battery directly below the keypad, and connect the white 2-wire connector to the receptacle on the control board.

Figure 1. RTC battery connection

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 (150%)
I_L	Low Overload (110%)
RTC	Real Time Clock
VFD	Variable Frequency Drive

Rating label

Figure 2. Rating label (DG1)

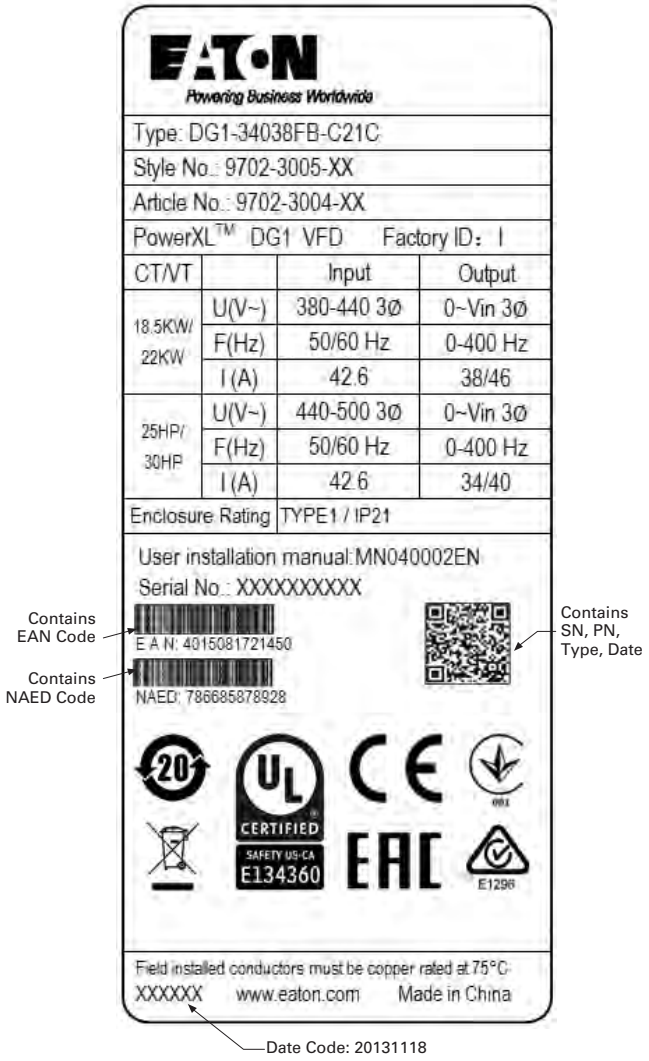


Figure 3. Rating label (DH1)

General information

The PowerXL Series drives provide 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 two 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. The I/O boards are interchangeable between different members of the PowerXL Series drives.

Option Card Slots

The control board is located inside the control unit of the PowerXL Series Drive. There are two slots, labeled A and B, on the control board. The different option boards can be added to any slots. For more information, see "PowerXL Series Option Board Summary." When the PowerXL Series Drive is assembled at the factory, no option boards are installed in slots A and B. If an incorrect board is plugged into either slot, the board will not work, but there is no danger to personal or for equipment damage.

Figure 4. PowerXL Series control board location

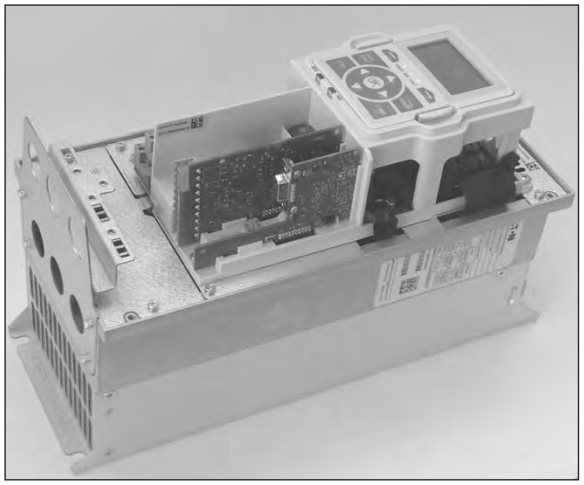
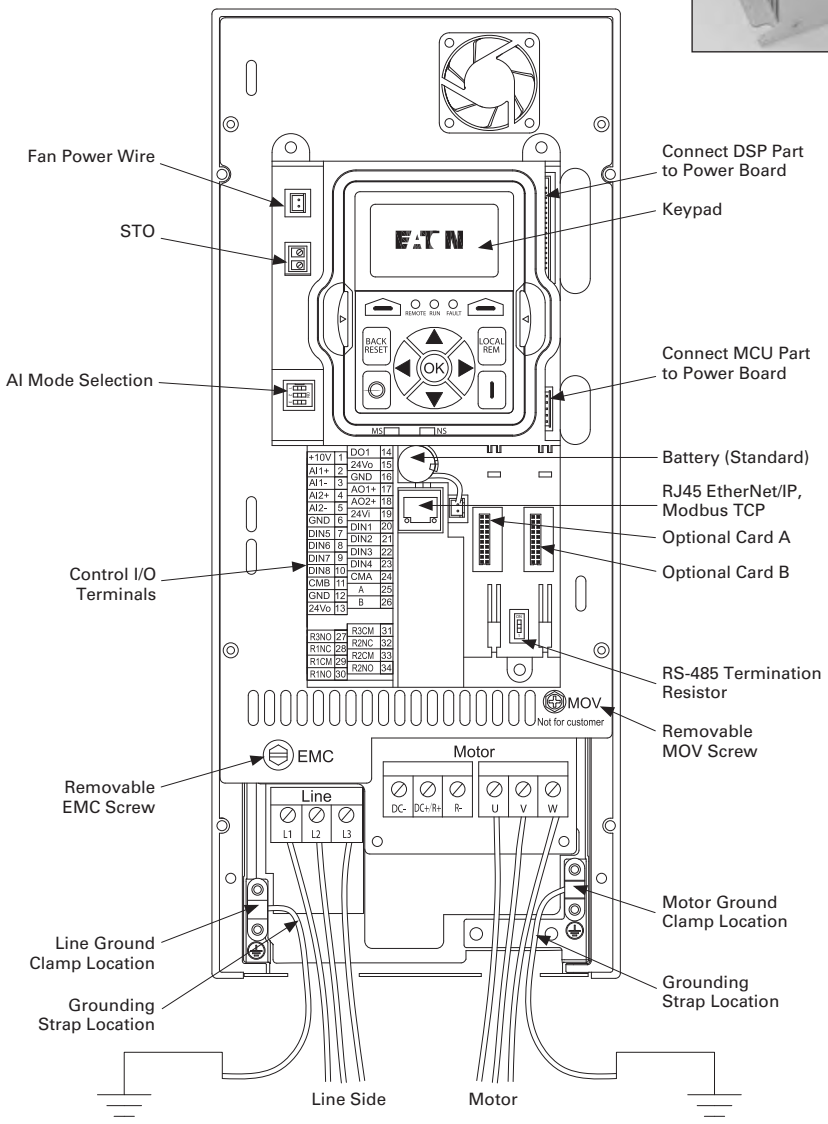


Figure 5. PowerXL Series control board location

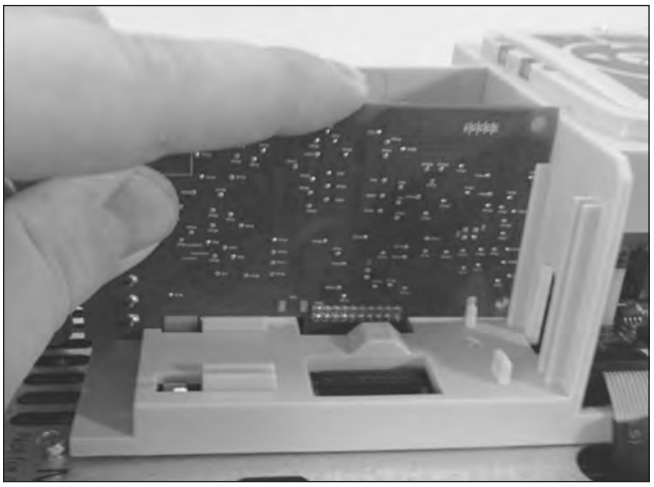


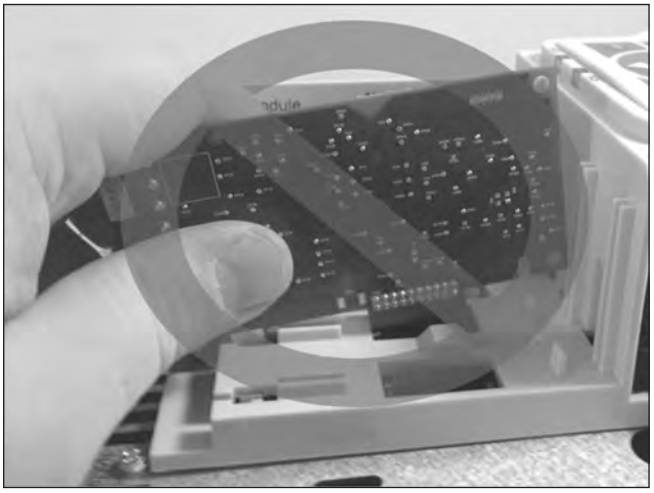
Installing PowerXL Series option board

Remove Utility line and control power from the drive. Install the option board in one of the slots available on the control board. To insert and remove the board, hold it in a horizontally straight position to avoid twisting the connector pins.

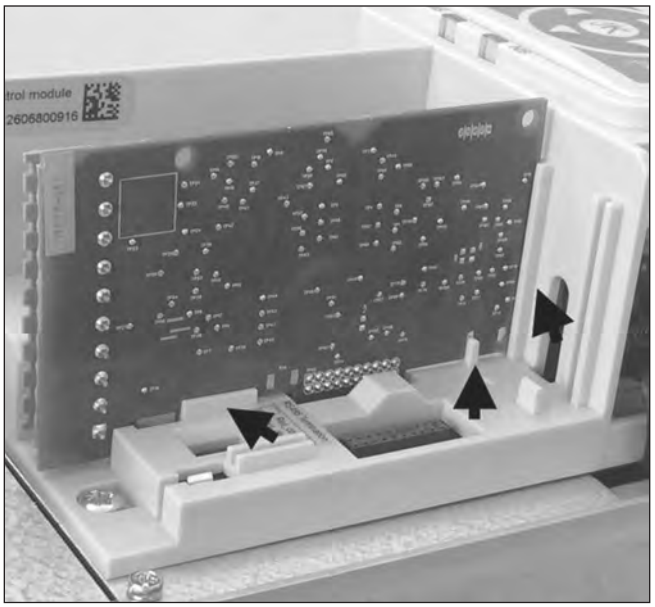
⚠ CAUTION

To prevent board damage, option cards and fieldbus boards must not be installed, removed or replaced while utility line or control power is applied to the drive.





Verify the board fits tightly in the metal clamp and plastic groove. If the board seems to be difficult to install in the slot, you should confirm that you are using one of the allowed slots for the option board.



Note: Check that the DIP switch settings on the board correspond to your need.

Control wiring

Digital I/O and 24 Vdc can use Stranded Cu or Solid Cu wire as specified below. Analog signal PT100 must use shielded cables. **Table 2** shows the wire sizes available. I/O terminals allow for 5.00 mm connectors.

Table 2. Wire sizes

Wire type	Wire size	Terminal torque
Solid Cu –90 °C	12–28 AWG (0.2~2.5 mm²)	4.5 in-lb (0.5 Nm)
Stranded Cu –90 °C	12–30 AWG (0.2~2.5 mm²)	4.5 in-lb (0.5 Nm)

EMC directive

For the electrical equipment installed in the EMC, directive states that the equipment must not disturb the environment and must be immune to other electromagnetic disturbances in the environment. **Table 3** indicates the requirements for the control wiring to meet this directive.

Table 3. Control wiring requirements

Item	Directive
Product	IEC 61800-2
Safety	UL 508C, IEC / EN 61800-5-1
EMC (at default settings)	Immunity: EN / IEC 61800-3, 2nd environment
	Radiated emissions: EN / IEC 61800-3 (Transient Testing included), 1st environment
	Conducted emissions: EN / IEC 61800-3
	Category C1: is possible with external filter connected to drive. Please consult factory
	Category C2: with internal filter maximum of 10m motor cable length (FR0: This is obtained with 2 turns on a ferrite core and using metal ground plate)
	Category C3: with internal filter maximum of 50m motor cable length (FR0: This is obtained with no ferrite core and metal plate)

Control cable grounding

It is recommended that the shielded cables be grounded as shown in **Figure 6**. Strip the cable insulation required allowing attachment to the frame with the grounding clamp.

Figure 6. Control cable grounding

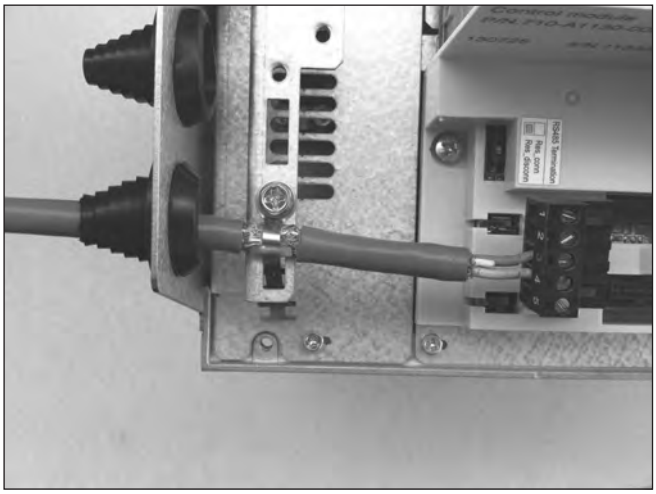


Table 4. PowerXL Series—drive option boards

DX H – NET – PROFB

Basic naming	Series	Type	Function
DX = PowerXL Drive	**H** = HVAC purpose	**NET** = Communication card **EXT** = I/O card **ACC** = Accessory **SPR** = Spare part **KEY** = Keypad **CBL** = Cable	**PROFB** = PROFIBUS **DEVICENET** = DeviceNet **CANopen** = CANopen **SWD-IP20** = SmartWire IP20 **SWD-IP54** = SmartWire IP54

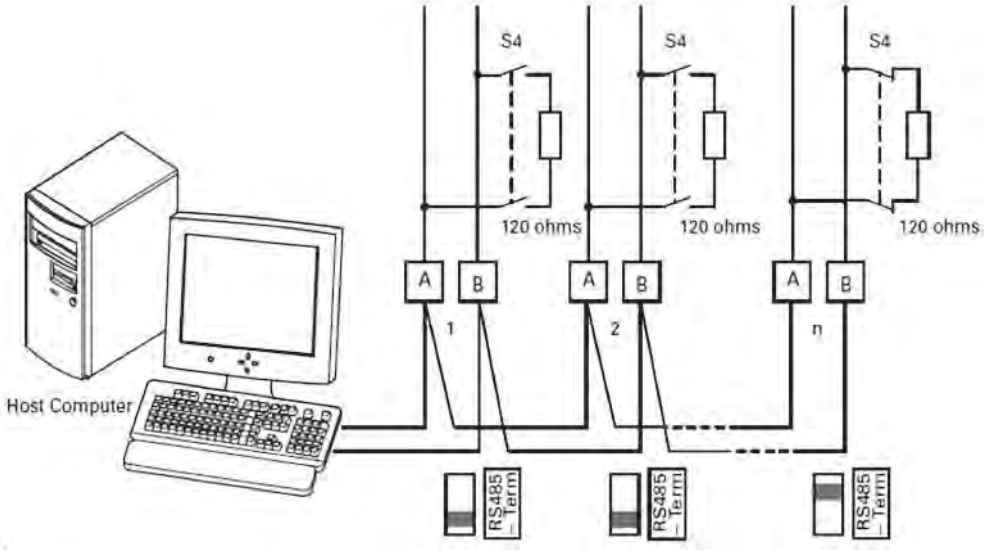
Table 5. PowerXL Series drives protocols

	PowerXL Series Drives		
Protocols	**DG1**	**DH1**	**On Board/Option Module**
Modbus RTU	■	■	On Board
BACnet MSTP	■	■	On Board
EtherNet/IP	■	—	On Board
Modbus TCP	■	■	On Board
PROFIBUS	■	■	Option Module
CANopen	■	—	Option Module
DeviceNET	■	—	Option Module
SmartWire-DT	■	—	Option Module
BACnet IP	—	■	On Board

Modbus RTU On-Board Communications

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

Figure 7. 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 parallel 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 6. Connections

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

Communications

Table 7. 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 A and B terminals on the drives control board.

Figure 8. Terminal wiring

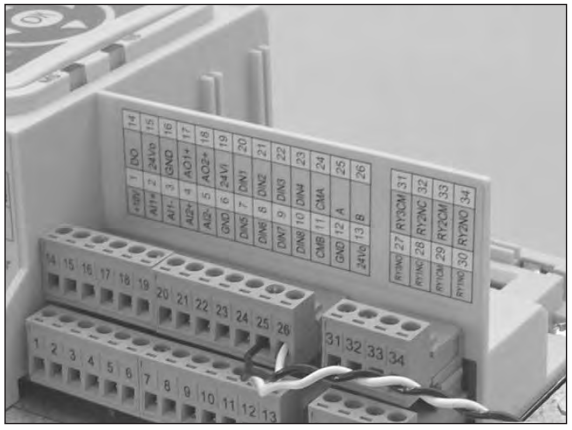
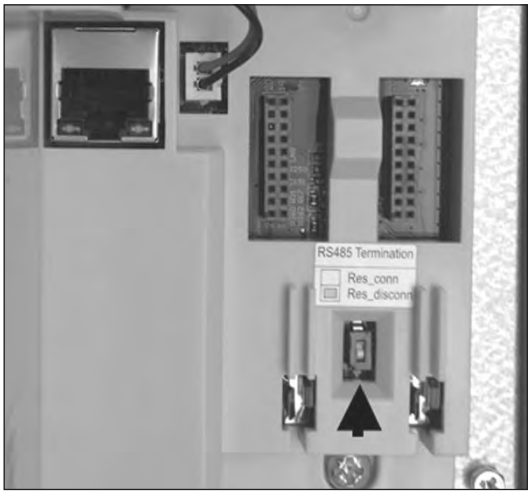
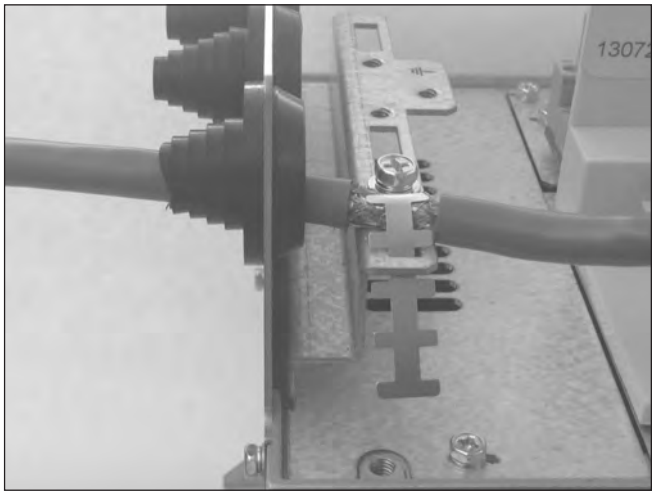


Figure 9. Termination resistor and shielding





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 10. DG1 keypad navigation to RS-485 menu

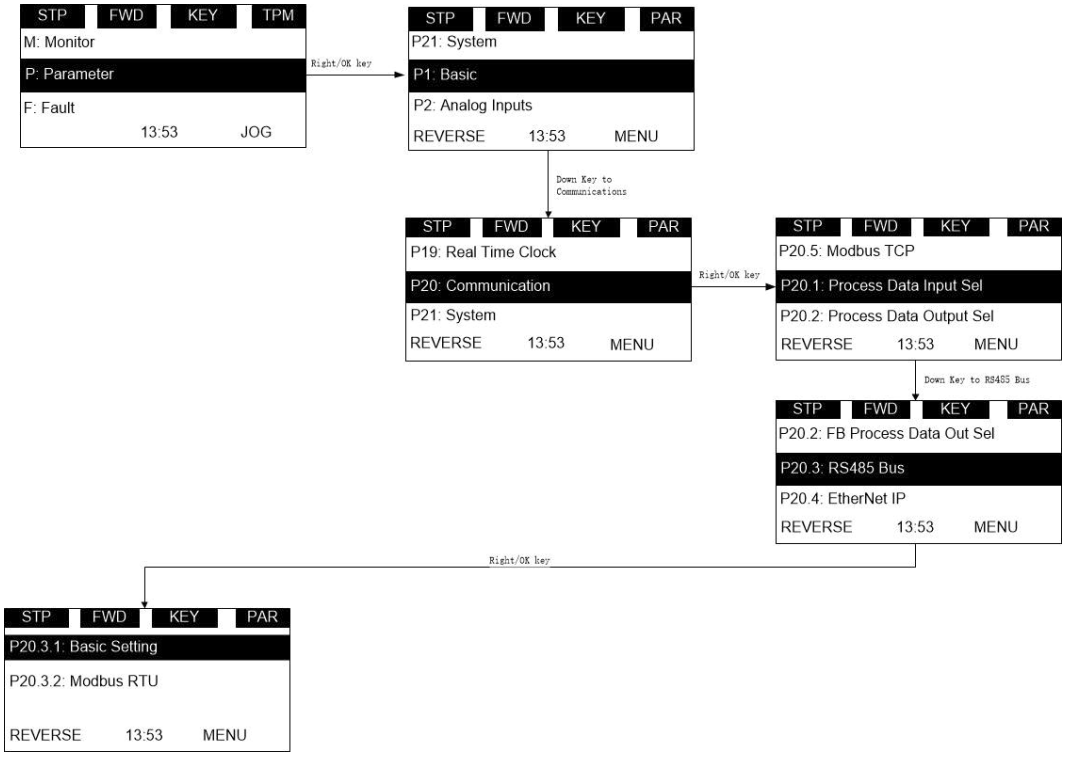
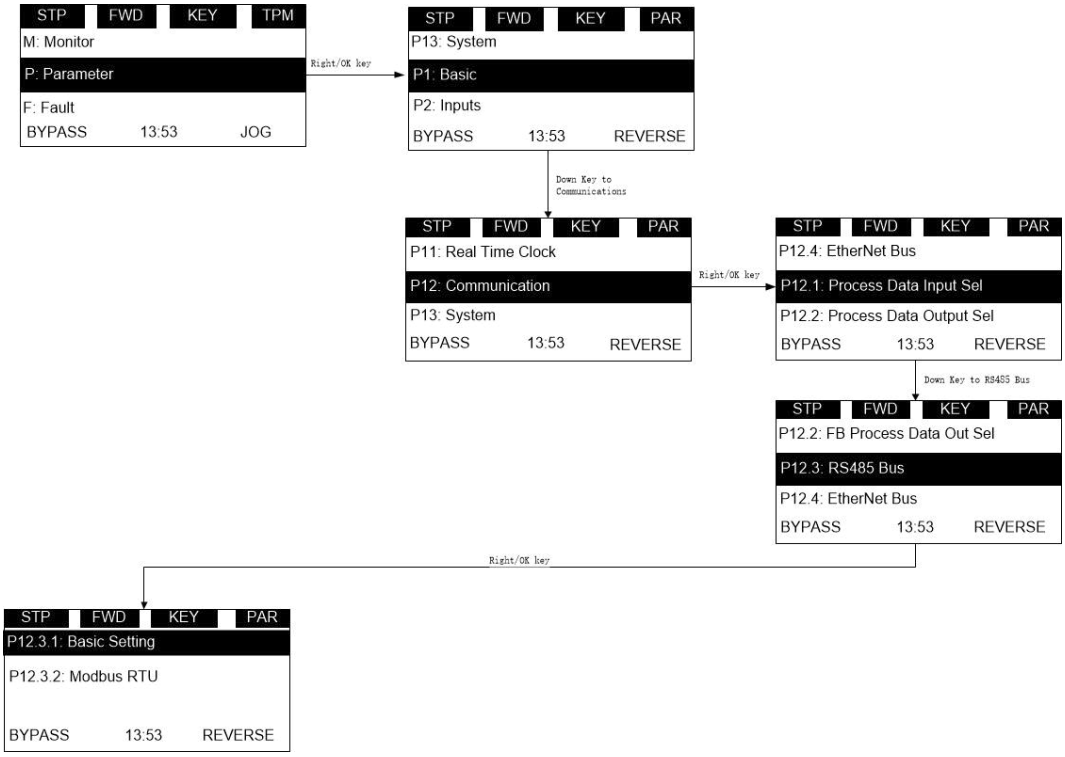


Figure 11. DH1 keypad navigation to RS-485 menu



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

Table 8. Modbus RTU

DG1 code	DH1 code	Parameter	Min.	Max.	Unit	Default	ID	Note
P20.3.1.1	P12.3.1.1	RS485 comm set				0	586	0 = Modbus RTU 1 = BACnet® MS/TP 2 = SmartWire-DT® ①②
P20.3.2.1	P12.3.2.1	Slave address	1	247		1	587	
P20.3.2.2	P12.3.2.2	Baud rate				1	584	0 = 9600 1 = 19200 2 = 38400 3 = 57600 4 = 115200
P20.3.2.3	P12.3.2.3	Parity type				2	585	0 = None, 2 Stop Bits 1 = Odd, 1 Stop Bit 2 = Even, 1 Stop Bit
P20.3.2.4	P12.3.2.4	Protocol status				0	588	0 = Initial 1 = Stopped 2 = Operational 3 = Faulted
P20.3.2.5	P12.3.2.5	Slave busy				0	589	0 = Not Busy 1 = Busy
P20.3.2.6	—	Parity error				0	590	
P20.3.2.7	—	Slave fault				0	591	
P20.3.2.8	—	Last fault response				0	592	
P20.3.2.9	—	Comm timeout modbus RTU			ms	10000	593	
P20.3.2.10	P12.3.2.6	Modbus RTU/BACNet 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.

① Not available on the PowerXL DH1.

② For SmartWire-DT: Before connecting the power supply to both the Drive and PLC, ensure devices are off before connecting the 8 pin flat cable to prevent damage to the boards.

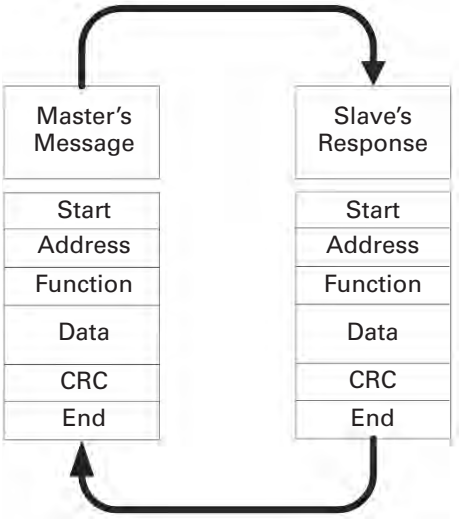
Modbus communication standards

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 12. 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 9. 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: 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 10. 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 11. 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 12. 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 13. 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 14. 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 15. 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 16. 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 17. 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 18. 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 19. 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 20. 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
2004–2011	42004–42011 (32004–32011)	Process Data In	1/1
2104–2111	42104–42111 (32104–32111)	Process Data Out	1/1

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 21. 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	
2105	32105, 42105	FB Process Data Out 2	
2106	32106, 42106	FB Process Data Out 3	
2107	32107, 42107	FB Process Data Out 4	
2108	32108, 42108	FB Process Data Out 5	
2109	32109, 42109	FB Process Data Out 6	
2110	32110, 42110	FB Process Data Out 7	
2111	32111, 42111	FB Process Data Out 8	

Table 22. 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

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 23. 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

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
①	①	①	①	①	①	FB Ref	FB Ctrl	Bypass	FB DI 4	FB DI 3	FB DI 2	FB DI 1	Fault Reset	Reverse	RUN

Note:
① The bit is not used.

Table 24. 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
10–15	Not in use	Not in use

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 25. 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	
2105	32105, 42105	FB Process Data Out 2	
2106	32106, 42106	FB Process Data Out 3	
2107	32107, 42107	FB Process Data Out 4	
2108	32108, 42108	FB Process Data Out 5	
2109	32109, 42109	FB Process Data Out 6	
2110	32110, 42110	FB Process Data Out 7	
2111	32111, 42111	FB Process Data Out 8	

FB Status Word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
—	—	—	—	—	—	—	—	—	—	—	Direction	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 26. 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	Not in use	Not in use
9–15	Not in use	Not In use

Table 27. 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	Motor Flux Off	Motor Flux On ①
8	Motor Speed Limit On	Motor Speed Limit Off ①
9	Encoder Direction Off	Encoder Direction On ①
10	Under Voltage Fast Stop Off	Under Voltage Fast Stop On ①
11	DC Brake Off	DC Brake On
12	FB Ref Not Enable	FB Ref Enabled
13	Motor Start Delay Off	Motor Start Delay On
14	Remote Not Enable	Remote Enable
15	FB WD Pulse Not Enabled	FB WD Pulse Enable ①

Note:
① 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 8

Process Data Out values 1 to 8 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 28. 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	—	

Process data IN (master → slave)

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

Table 29. Process data IN

ID	Data	Value	Unit	Scale
2003	Reference	Speed Reference	Hz	0.01
2001	Control Word	—	—	—
2004	Process Data IN1	①	%	0.01%
2005	Process Data IN2	①	%	0.01%
2006	Process Data IN3	①	%	0.01%
2007	Process Data IN4	①	%	0.01%
2008	Process Data IN5	①	%	0.01%
2009	Process Data IN6	①	%	0.01%
2010	Process Data IN7	①	%	0.01%
2011	Process Data IN8	①	%	0.01%

Note:
① 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 30. 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	DHCP with Auto-IP
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

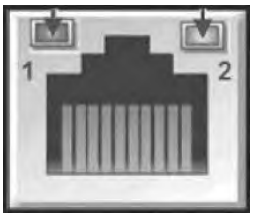
Byte 8. Data (of variable length)

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 31. 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

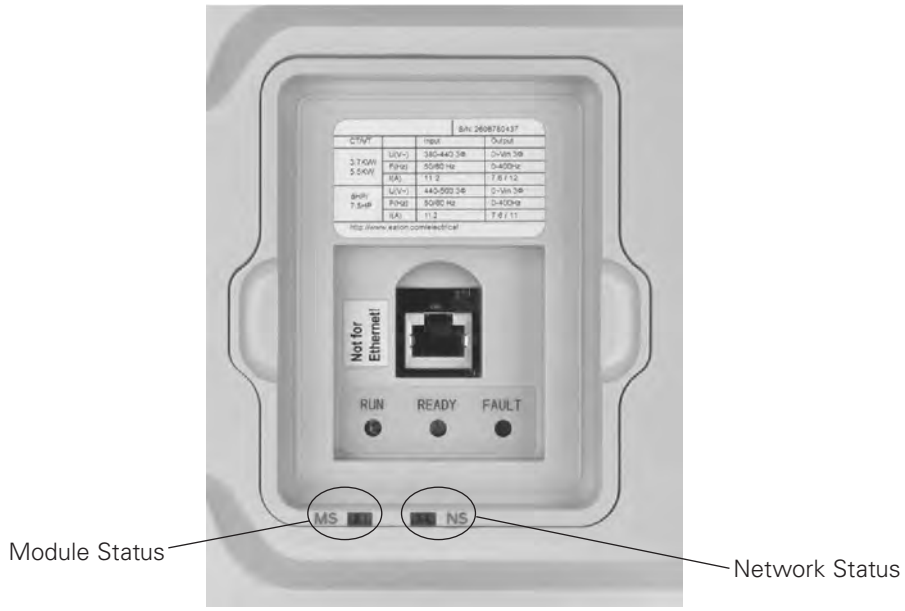
Ethernet LED indications at power up

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.

Figure 13. Module and network status



Module status indications

Represents the state of the drive.

Table 32. Module status LED description

Indicator state	Summary	Meaning
Steady Off	No power	No power is supplied to the device.
Steady Green	Device operational	Device is operating correctly.
Flashing Green ①	Standby	Device has not been configured.
Flashing Red ①	Minor fault	Device has detected a recoverable minor fault. Note. An incorrect or inconsistent configuration would be considered a minor fault. Also check that on clearing the fault, it turns off.
Steady Red	Major fault	Device has detected a non-recoverable major fault.
Flashing Green/Red ①	Self-test	Device is performing its power up testing.

① Flash rate is 1 flash per second.

Network status indications

Represents the state of the Ethernet port network interface.

Table 33. Network status LED description

Indicator state	Summary	Meaning
Steady Off	Not powered, no IP address	Device is powered off, or is powered on but with no IP address configured (Interface Configuration attribute of the TCP/IP Interface Object).
Flashing Green ①	No connections	An IP address is configured, but no CIP connections are established, and an Exclusive Owner connection has not timed out.
Steady Green	Connected	At least one CIP connection (any transport class) is established, and an Exclusive Owner connection has not timed out.
Flashing Red ①	Connection timeout	Device is powered on and an exclusive Owner connection has timed out. It returns to steady green only when all timed out Exclusive Owner connections are established.
Steady Red	Major fault	Device has detected a non-recoverable major fault.
Flashing Green/Red ①	Self-test	Device is performing its power up testing.

① Flash rate is 1 flash per second.

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 14. CAT-5e cable

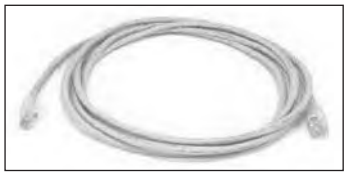


Figure 15. DG1 keypad navigation to ethernet comm settings

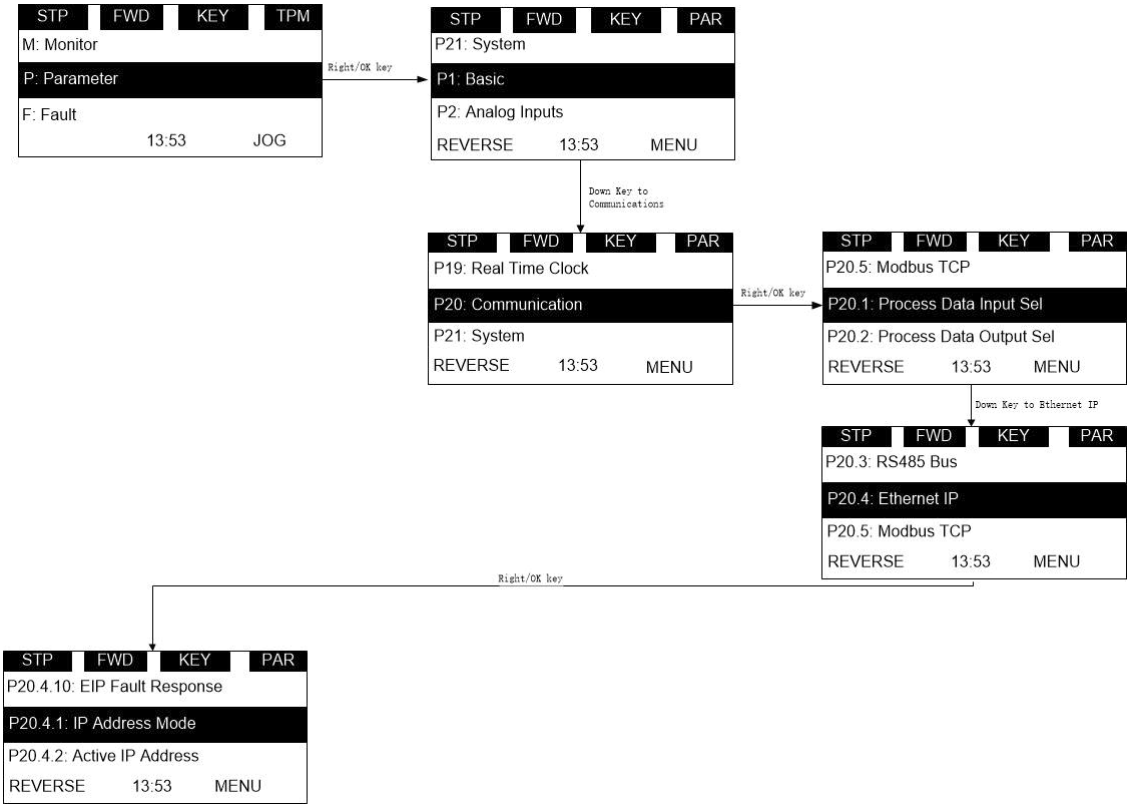
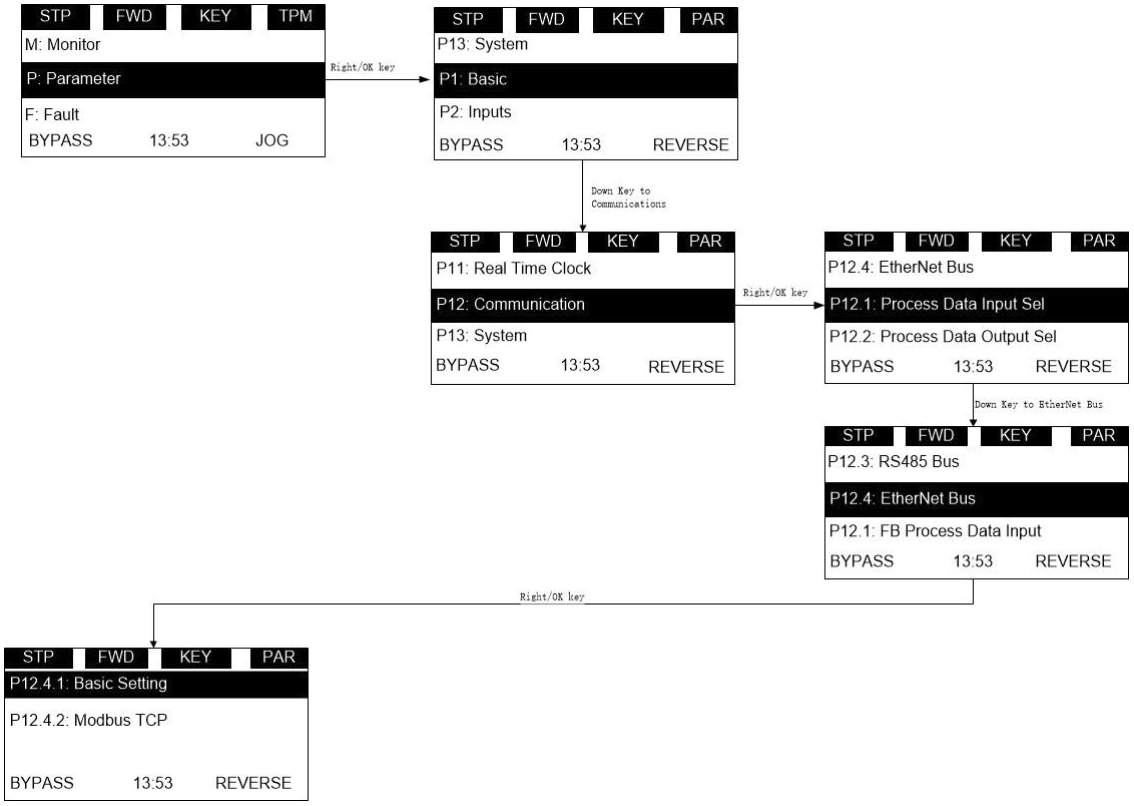


Figure 16. DH1 keypad navigation to ethernet comm settings



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

Table 34. EtherNet/IP / Modbus TCP—P20.3

DG1 code	DH1 code	Parameter	Min.	Max.	Unit	Default	ID	Note
P20.4.1	P12.4.1.1	IP Address Mode				1	1500	0 = Static IP 1 = DHCP with AutoIP
P20.4.2	P12.4.1.2	Active IP Address					1507	
P20.4.3	P12.4.1.3	Active Subnet Mask					1509	
P20.4.4	P12.4.1.4	Active Default Gateway					1511	
P20.4.5	P12.4.1.5	MAC Address					1513	
P20.4.6	P12.4.1.6	Static IP Address				192.168.1.254	1501	
P20.4.7	P12.4.1.7	Static Subnet Mask				255.255.255.0	1503	
P20.4.8	P12.4.1.8	Static Default Gateway				192.168.1.1	1505	
—	P12.4.1.9	Enable BACnet IP	0	1		0	1725	0 = Disable 1 = Enable

Table 35. EtherNet/IP / Modbus TCP—P20.3, continued

DG1 code	DH1 code	Parameter	Min.	Max.	Unit	Default	ID	Note
P20.5.1	P12.4.2.1	Connection Limit	0	5		5	609	
P20.5.2	P12.4.2.2	Modbus TCP Unit ID				1	610	
P20.5.3	P12.4.2.3	Comm Timeout Modbus TCP			ms	10000	611	
P20.5.4	P12.4.2.4	Protocol Status				0	612	0 = Stopped 1 = Operational 2 = Faulted
P20.5.5	—	Slave Busy				0	613	0 = Not Busy 1 = Busy
P20.5.6	—	Parity Error				0	614	
P20.5.7	—	Slave Failure				0	615	
P20.5.8	—	Last Fault Response				0	616	
P20.5.9	P12.4.2.5	Modbus TCP Fault Response	0	1		0	2517	0 = In Fieldbus Control 1 = In all Control

DHCP

The EtherNet/IP 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/IP 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/IP 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/IP 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/IP 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 require drive to power cycle to get this change effective. Also ensure device MAC address.

Figure 17. DG1 Static IP mode

Figure 18. DH1 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 19. DG1 Static IP address

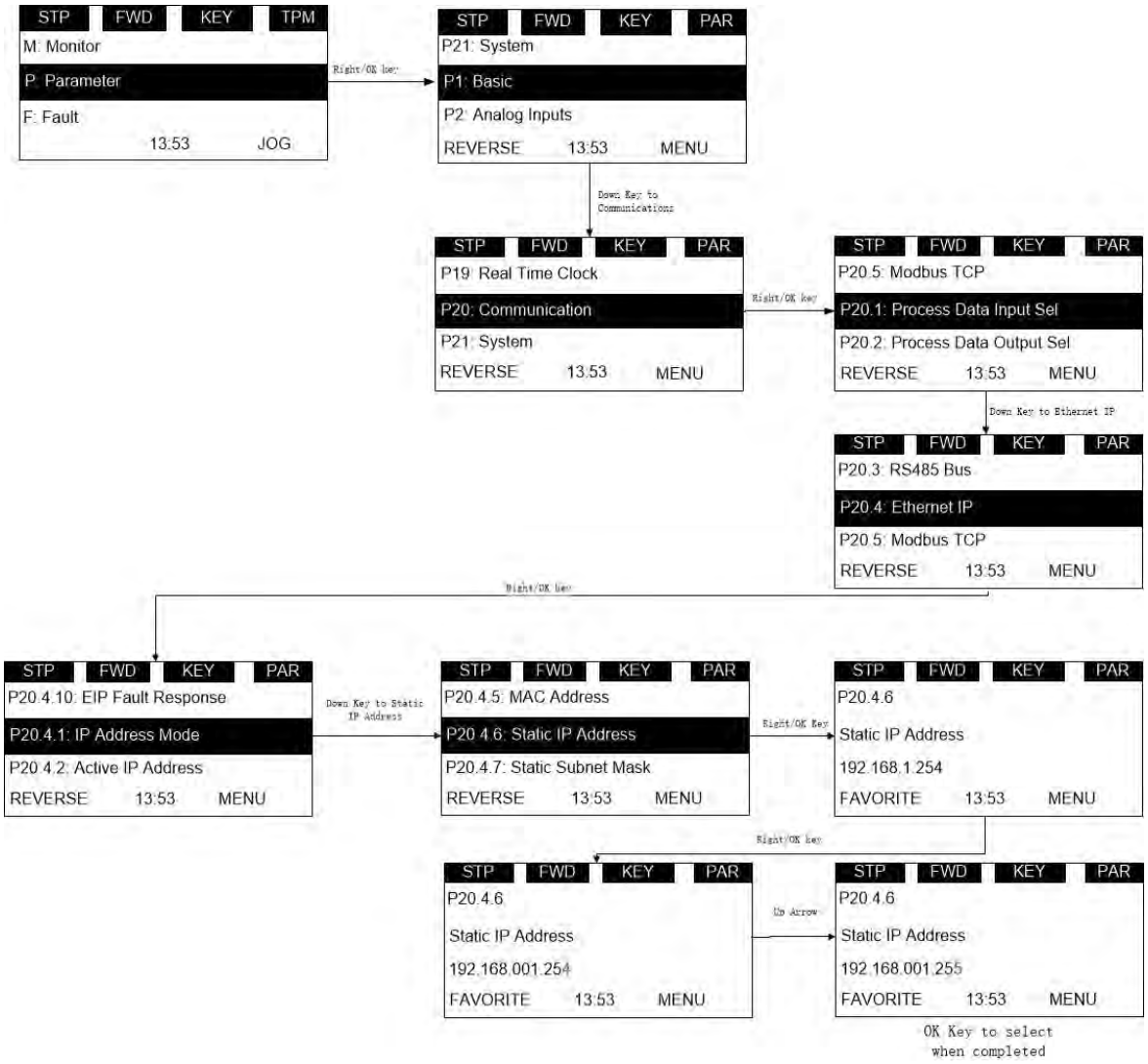
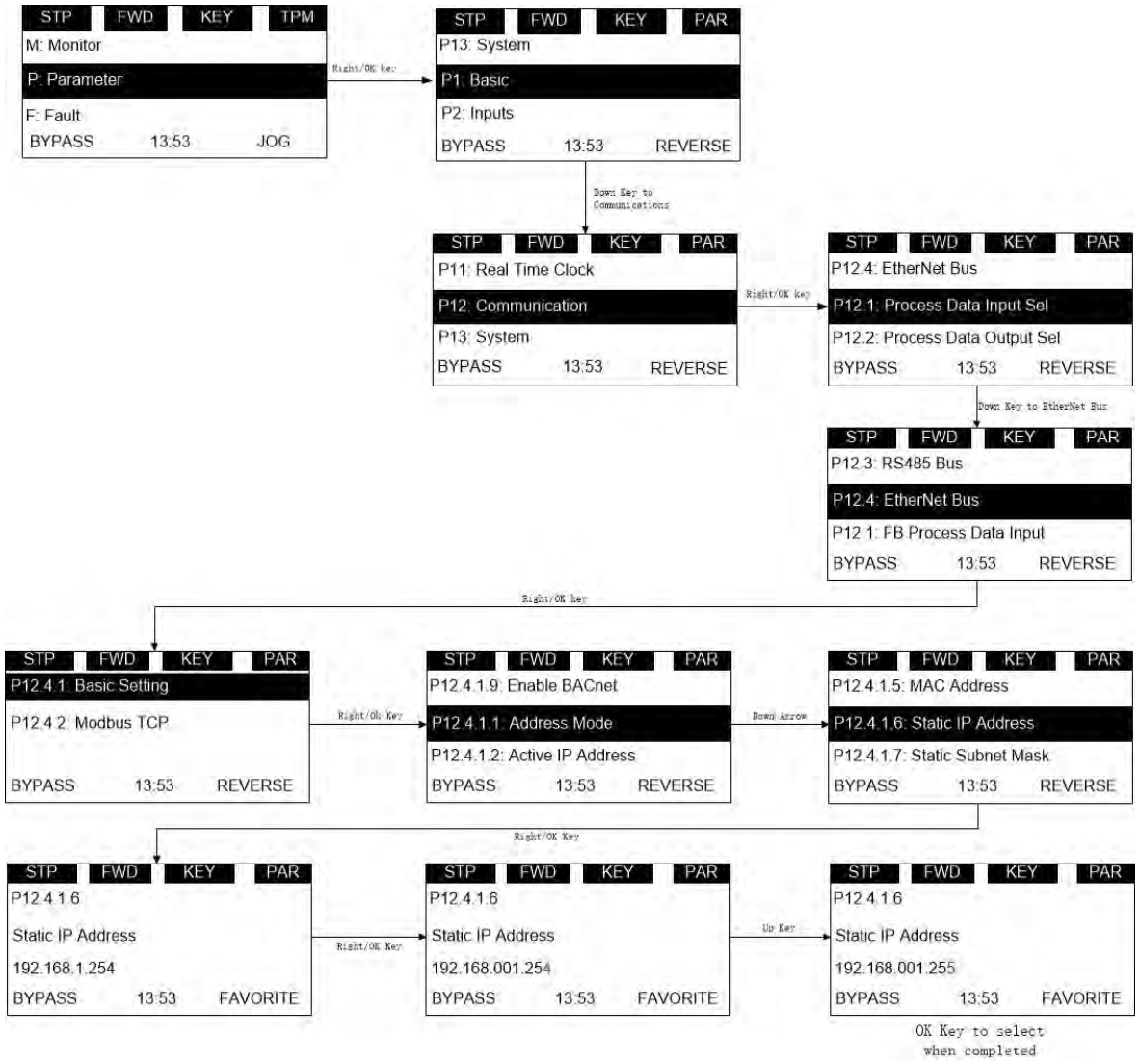


Figure 20. DH1 Static IP address



   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 36. 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 37. 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 38. 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 39. 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 40. 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 41. 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 42. 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 43. 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 44. 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 45. 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 46. 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
2004–2011	42004–42011 (32004–32011)	Process Data In	1/1
2104–2111	42104–42111 (32104–32111)	Process Data Out	1/1

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 47. 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	
2105	32105, 42105	FB Process Data Out 2	
2106	32106, 42106	FB Process Data Out 3	
2107	32107, 42107	FB Process Data Out 4	
2108	32108, 42108	FB Process Data Out 5	
2109	32109, 42109	FB Process Data Out 6	
2110	32110, 42110	FB Process Data Out 7	
2111	32111, 42111	FB Process Data Out 8	

Table 48. 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%
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

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–PD8 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–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 49. 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

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
①	①	①	①	①	①	FB Ref	FB Ctrl	BYS	FB DIN 4	FB DIN 3	FB DIN 2	FB DIN 1	F_RST	DIR	RUN

Note:
① 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 50. 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
10–15	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. Process Data Out is located in range ID 2101–2199. See table below.

Table 51. 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	
2105	32105, 42105	FB Process Data Out 2	
2106	32106, 42106	FB Process Data Out 3	
2107	32107, 42107	FB Process Data Out 4	
2108	32108, 42108	FB Process Data Out 5	
2109	32109, 42109	FB Process Data Out 6	
2110	32110, 42110	FB Process Data Out 7	
2111	32111, 42111	FB Process Data Out 8	

FB status word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
—	—	—	—	—	—	—	—	RUNEN	BYS	AREF	WARN	FLT	DIR	RUN	RDY

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 52. 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	Not in use	Not in use
9–15	Not in use	Not In use

Table 53. Table 60. 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	Motor Flux Off	Motor Flux On ①
8	Motor Speed Limit On	Motor Speed Limit Off ①
9	Encoder Direction Off	Encoder Direction On ①
10	Under Voltage Fast Stop Off	Under Voltage Fast Stop On ①
11	DC Brake Off	DC Brake On
12	FB Ref Not Enable	FB Ref Enabled
13	Motor Start Delay Off	Motor Start Delay On
14	Remote Not Enable	Remote Enable
15	FB WD Pulse Not Enabled	FB WD Pulse Enable ①

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 8

Process Data Out values 1 to 8 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 54. 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	—	

Process data IN (master → slave)

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

Table 55. Process data IN

ID	Data	Value	Unit	Scale
2003	Reference	Speed Reference	%	0.01
2001	Control Word	—	—	—
2004	Process Data IN1	①	%	0.01%
2005	Process Data IN2	①	%	0.01%
2006	Process Data IN3	①	%	0.01%
2007	Process Data IN4	①	%	0.01%
2008	Process Data IN5	①	%	0.01%
2009	Process Data IN6	①	%	0.01%
2010	Process Data IN7	①	%	0.01%
2011	Process Data IN8	①	%	0.01%

① Process Data IN1 through Process Data IN8 change based off the selected application. See **Appendix B** for layout

EtherNet/IP On-Board Communications

The EtherNet/IP communication interface features standard EtherNet/IP communication, allowing you to easily manage drive control and data over EtherNet/IP networks.

EtherNet/IP communication interface features:

- Provides a means to control, configure and collect data over an Ethernet network
- 10/100 Mbps, full duplex operation
- Explicit messaging (for example, parameter read/write)
- Diagnostics, device items and events

Every device connected to an Ethernet network has two identifiers. a MAC address and an IP address. The MAC address (address format. 00.D0.AF.xx.yy.zz) is unique to the appliance and cannot be changed. The EtherNet/IP board's MAC address can be found on the sticker attached to the board.

In a local network, IP addresses are determined by the network server using DHCP protocol. The user can also manually define the network address for the drive as long as all units connected to the network are given the same network portion of the address. For more information about IP addresses, contact your network administrator.

Overlapping IP addresses can cause conflicts between appliances. For more information about setting IP addresses, see "Manual IP Address Configuration" on **Page 21.**

Note: EtherNet/IP is a trademark of the Open DeviceNet Vendor Association (ODVA).

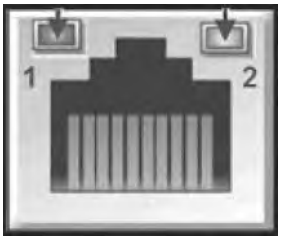
EtherNet/IP specifications

Table 56. EtherNet/IP 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	DHCP with Auto-IP
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

Hardware specifications

Ethernet port LED indications



Ethernet LED

1. Ethernet Link Status
2. Ethernet Link Speed

Table 57. 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

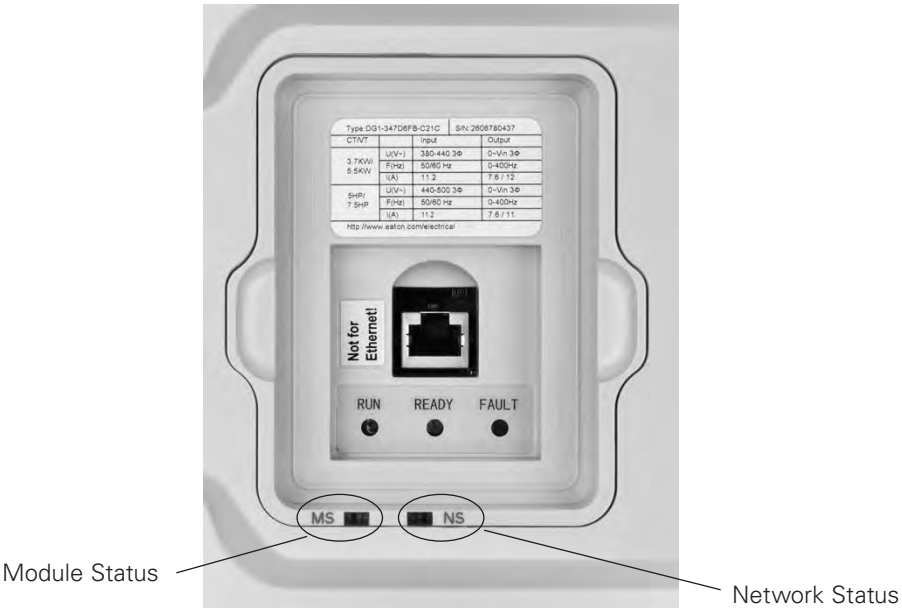
Ethernet LED indications at power up

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.

Figure 21. Module and network status



Module status indications

Represents the state of the drive.

Table 58. Module status LED description

Indicator state	Summary	Meaning
Steady off	No power	No power is supplied to the PowerXL.
Steady green	Device operational	Drive is operating correctly.
Flashing green ①	Standby	Drive has not been configured.
Flashing red ①	Minor fault	Drive has detected a recoverable minor fault. Note. An incorrect or inconsistent configuration would be considered a minor fault. Also check that on clearing the fault, it turns off.
Steady red	Major fault	Drive has detected a non-recoverable major fault.
Flashing green/red	Self-test	Drive is performing its power on self test.

Network status indications

Represents the state of the Ethernet port network interface.

Table 59. Network status LED description

Indicator State	Summary	Meaning
Steady off	Not powered, no IP address	Drive is powered off, or is powered on but with no IP address configured (Interface Configuration attribute of the TCP/IP Interface Object).
Flashing green ①	No connections	An IP address is configured, but no CIP connections are established, and an Exclusive Owner connection has not timed out.
Steady green	Connected	At least one CIP connection (any transport class) is established, and an Exclusive Owner connection has not timed out.
Flashing red ①	Connection timeout	Drive is powered on and an exclusive Owner connection has timed out. It returns to steady green only when all timed out Exclusive Owner connections are established.
Steady red	Duplicate IP address	Drive has detected a Duplicate IP.
Flashing green/red	Self-test	Drive is performing its power on self test.

① Flash rate is 1 flash per second.

EtherNet/IP overview

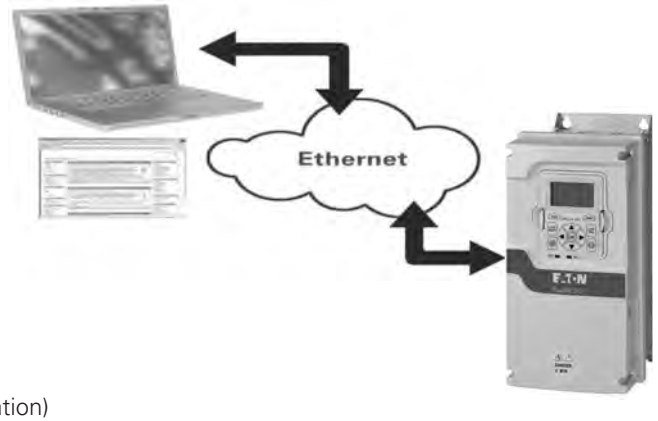
EtherNet/IP was introduced in 2001 and today is the most developed, proven and complete industrial Ethernet network solution available for manufacturing automation. EtherNet/IP is a member of a family of networks that implements the Common Industrial Protocol (CIP.) at its upper layers. CIP encompasses a comprehensive suite of messages and services for a variety of manufacturing automation applications, including control, safety, synchronization, motion, configuration and information. As a truly media-independent protocol that is supported by hundreds of vendors around the world, CIP provides users with unified communication architecture throughout the manufacturing enterprise.

There are two common use cases of Ethernet—devices are "human to machine" and "machine to machine." Basic features are presented in the pictures below.

1. Human to machine (graphical user interface, relatively slow communication)

   User Interface

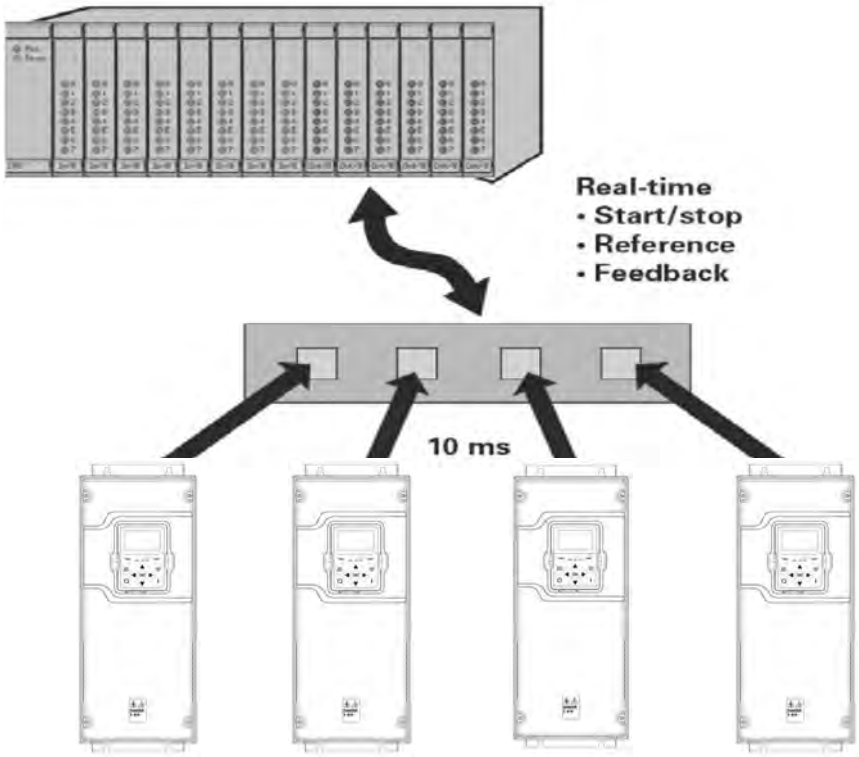
Figure 22. Human to machine user interface



2. Machine to machine (industrial environment, fast communication)

   Industrial Environment

Figure 23. Machine to machine (industrial environment, fast communication)



Connections and wiring

The EtherNet/IP board 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 24. CAT-5e cable

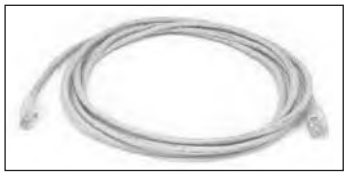


Table 60. EtherNet/IP network settings

DG1 code	Parameter	Min.	Max.	Unit	Default	ID	Note
P20.4.1	IP Address Mode				1	1500	0 = Static IP 1 = DHCP with AutoIP
P20.4.2	Active IP Address					1507	
P20.4.3	Active Subnet Mask					1509	
P20.4.4	Active Default Gateway					1511	
P20.4.5	MAC Address					1513	
P20.4.6	Static IP Address				192.168.1.254	1501	
P20.4.7	Static Subnet Mask				255.255.255.0	1503	
P20.4.8	Static Default Gateway				192.168.1.1	1505	
P20.4.9	EtherNet/IP Protocol Status				0	608	0 = Off 1 = Operational 2 = Faulted
P20.4.10	EIP Fault Response	0	1		0	2518	0 = In Fieldbus Control 1 = in all Control

Commissioning

Keypad EtherNet/IP communication menu

DHCP

The drives EtherNet/IP 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, EtherNet/IP 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 10seconds.

Note: If the network cable is broken from the EtherNet/IP slot, a fieldbus error is generated immediately.

Static IP address

In most cases the user may want to establish a Static IP Address for the drives EtherNet/IP 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/IP 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 drive 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.

Manual IP address configuration

Using the PowerXL drive keypad

Using the drive keypad to set the IP Address manually.

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

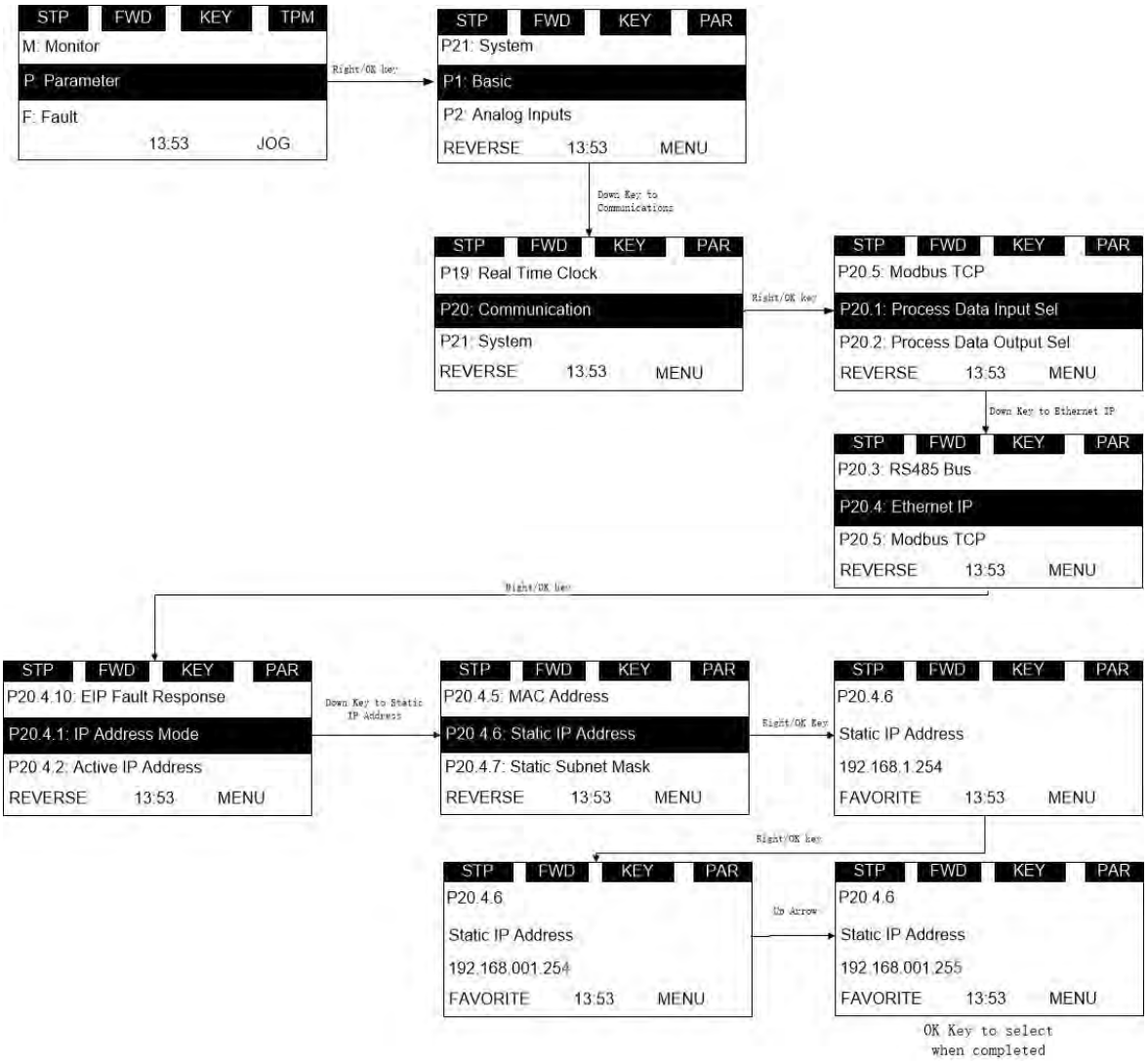
Note: Change in IP address mode will require PowerXL to power cycle to get this change effective. Also ensure device MAC address (Keypad menu. P20.3.5)

Figure 25. DG1 Static IP mode

2. Using drive keypad, set the IP address to the desired address setting by:

   a. Setting Static IP Address

Figure 26. DG1 Static IP address



   b. Setting Static Subnet Mask
   c. Setting Static Default Gateway
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 setting.

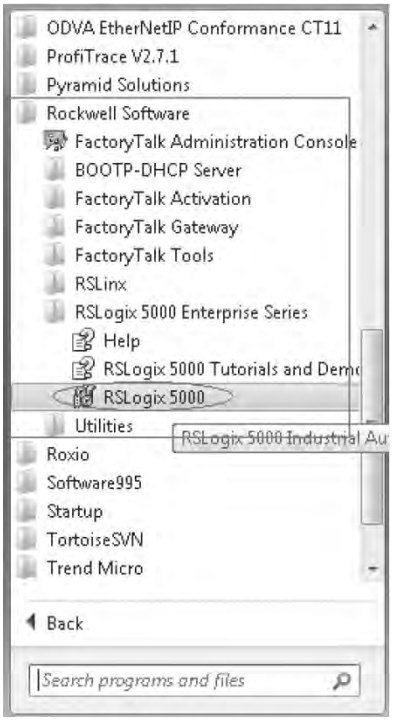
PLC programming

ControlLogix 5000

When using a ControlLogix PLC as an EIP master, you must first configure a compatible EtherNet/IP scanner, and then map ladder logic variables to the scanner. The following example is for an RSLogix5000 with a CompactLogix-L23E-QB1 PLC controller.

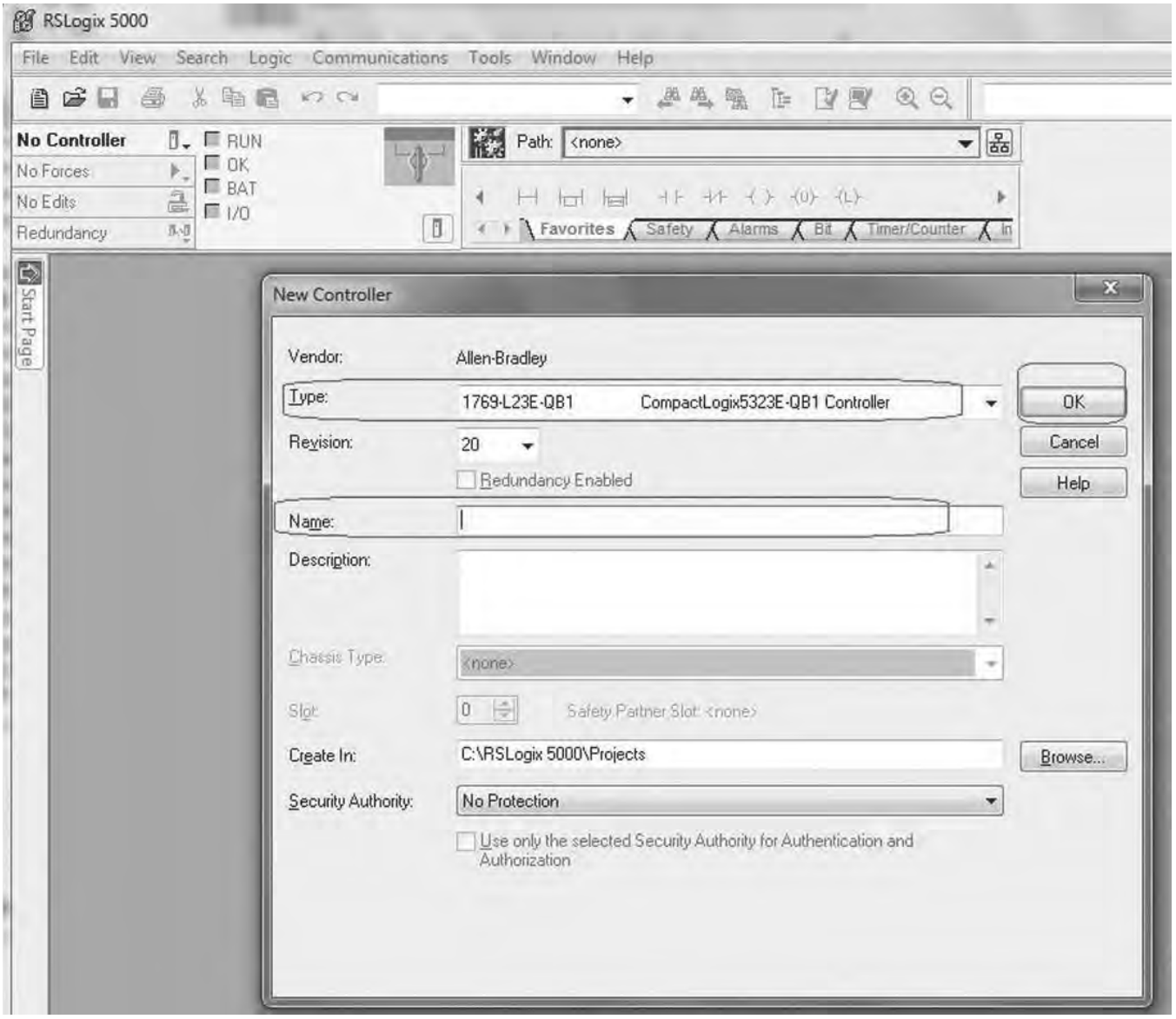
Note: Some PLCs do not support polled messaging for EtherNet/IP. For example, the SLC500 only supports explicit messaging.

Select windows Start ⟶ All Programs. Open RSLogix 5000.



From the Tools drop-down menu, select EDS Hardware Installation Tool to install the PowerXL DG1 Drive EtherNet/IP EDS file. This file can be downloaded from the Eaton website.

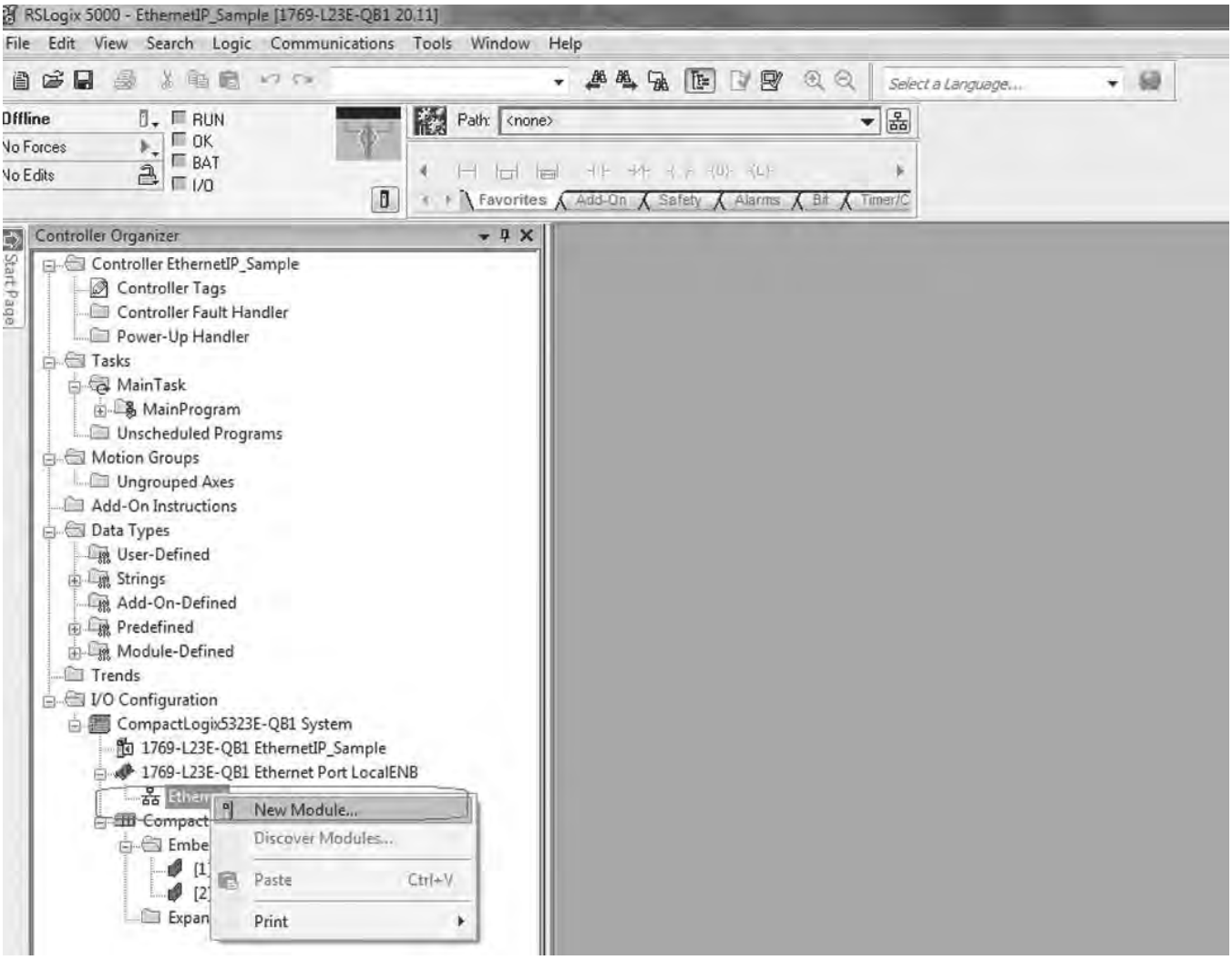
Select "New" from "File" menu. New controller window will pop-up. Select the controller and assign unique name.



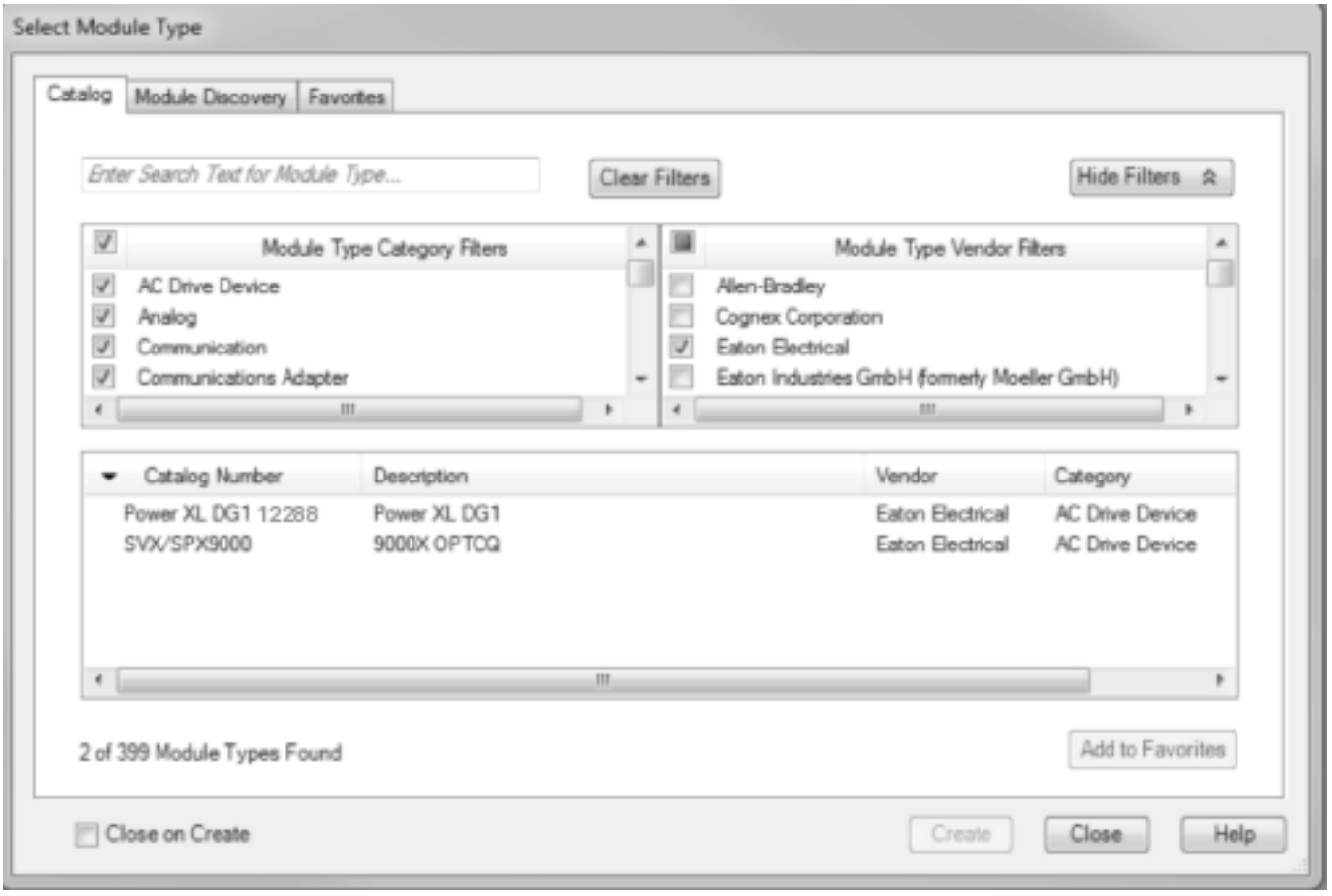
Press OK.

Right-click on Ethernet. Select "New Module."

Note: PC on which RSLogix (master) is running and PowerXL DG1 device (slave) should be connected in same network.

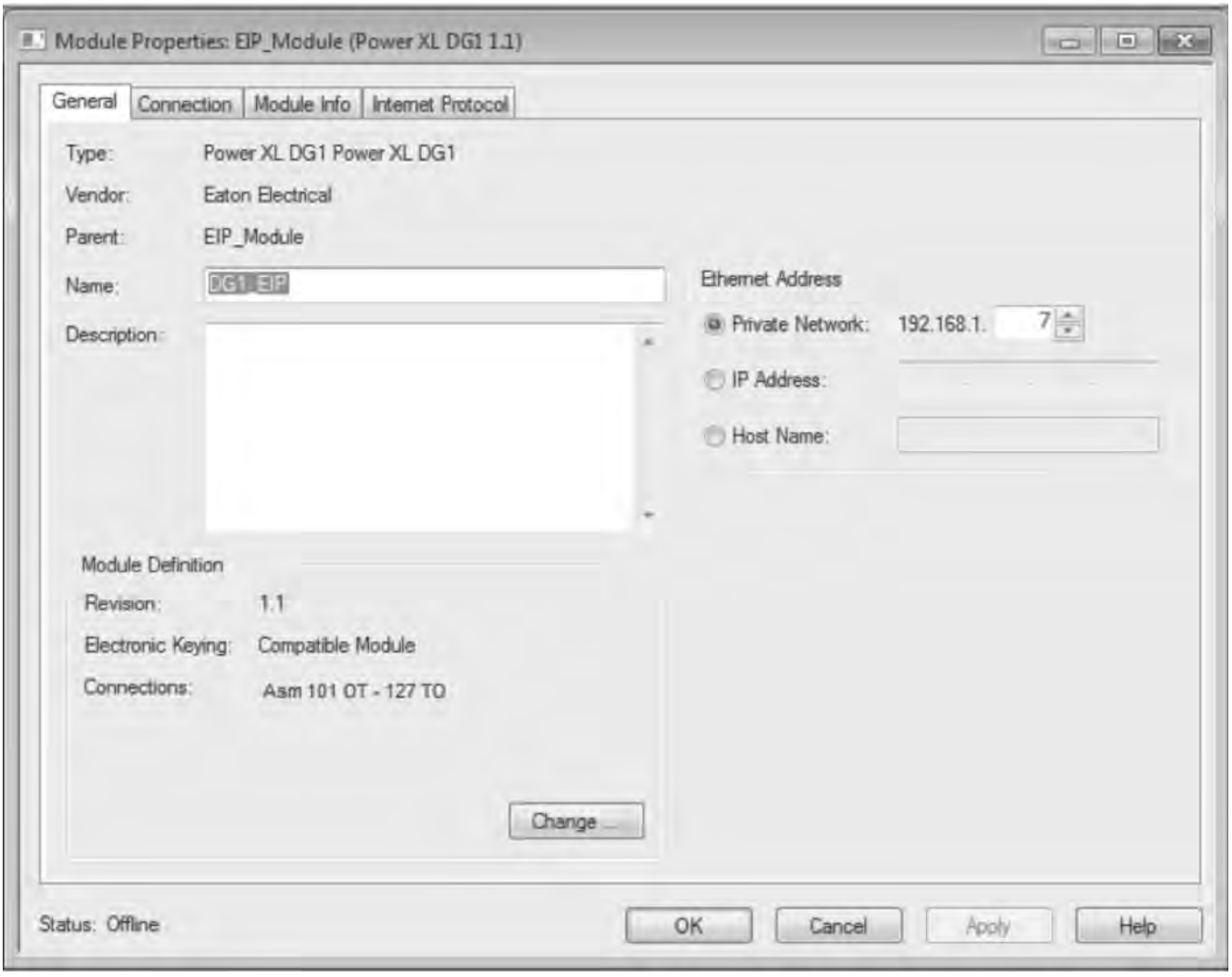


"Select Module Type" window will pop-up. Select "PowerXL DG1" (use filter to search PowerXL from catalog).

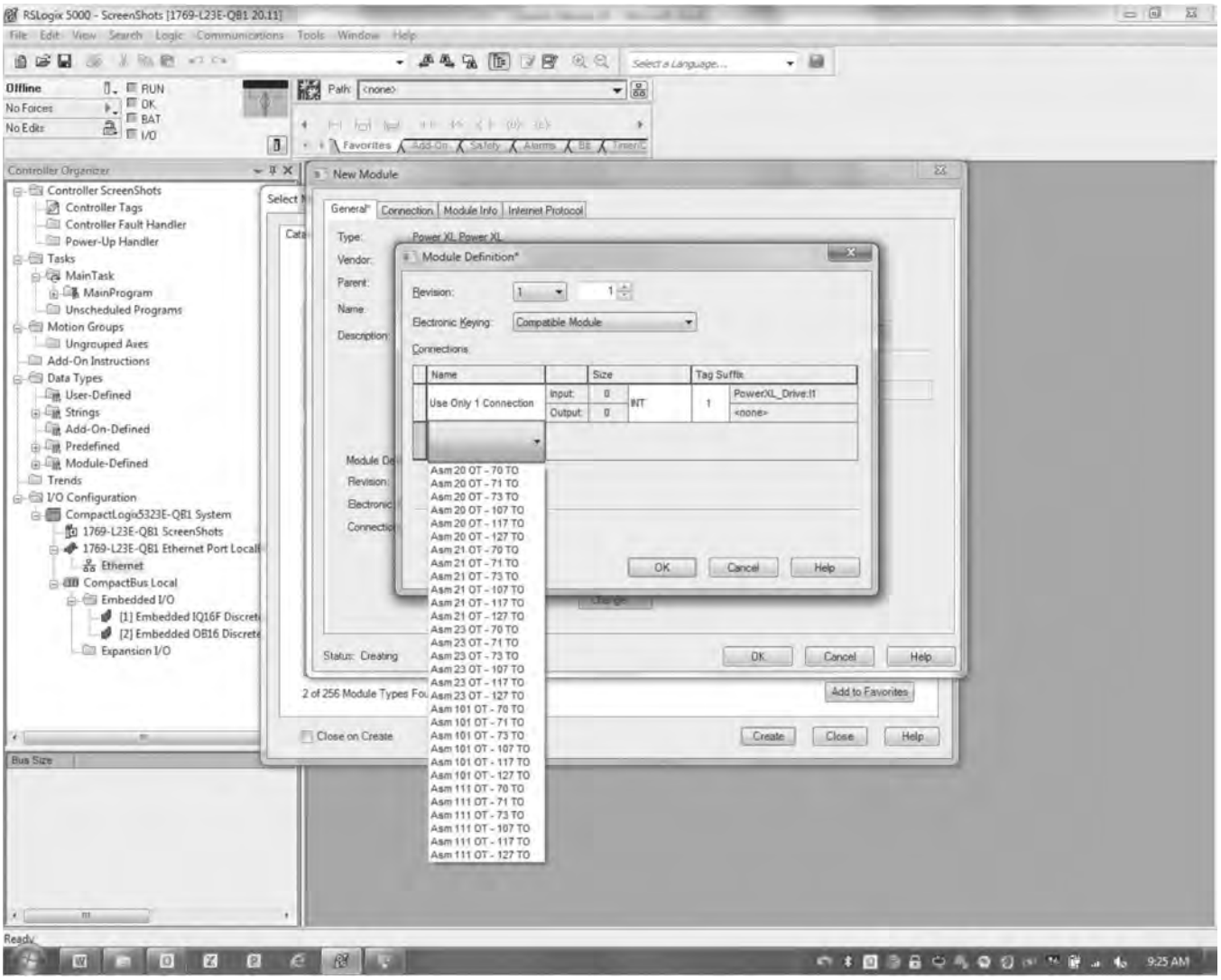


After selecting "PowerXL DG1," "New Module" window will pop-up (as shown below). Fill in unique name and appropriate IP address for device. Press OK. The device will get added under "Ethernet" module.

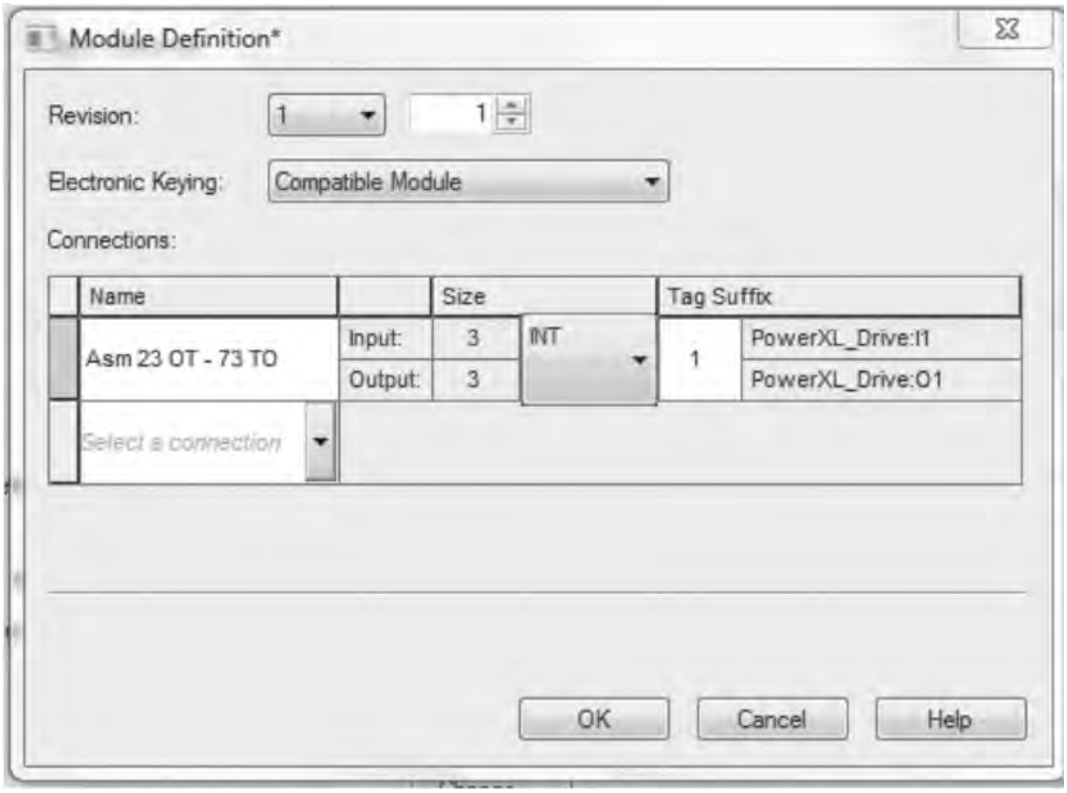
Note: You must change the class1 connection from provided default option by using "Change" button available on "New Module" window. This can also be done after adding the device under Ethernet by double-clicking on it.



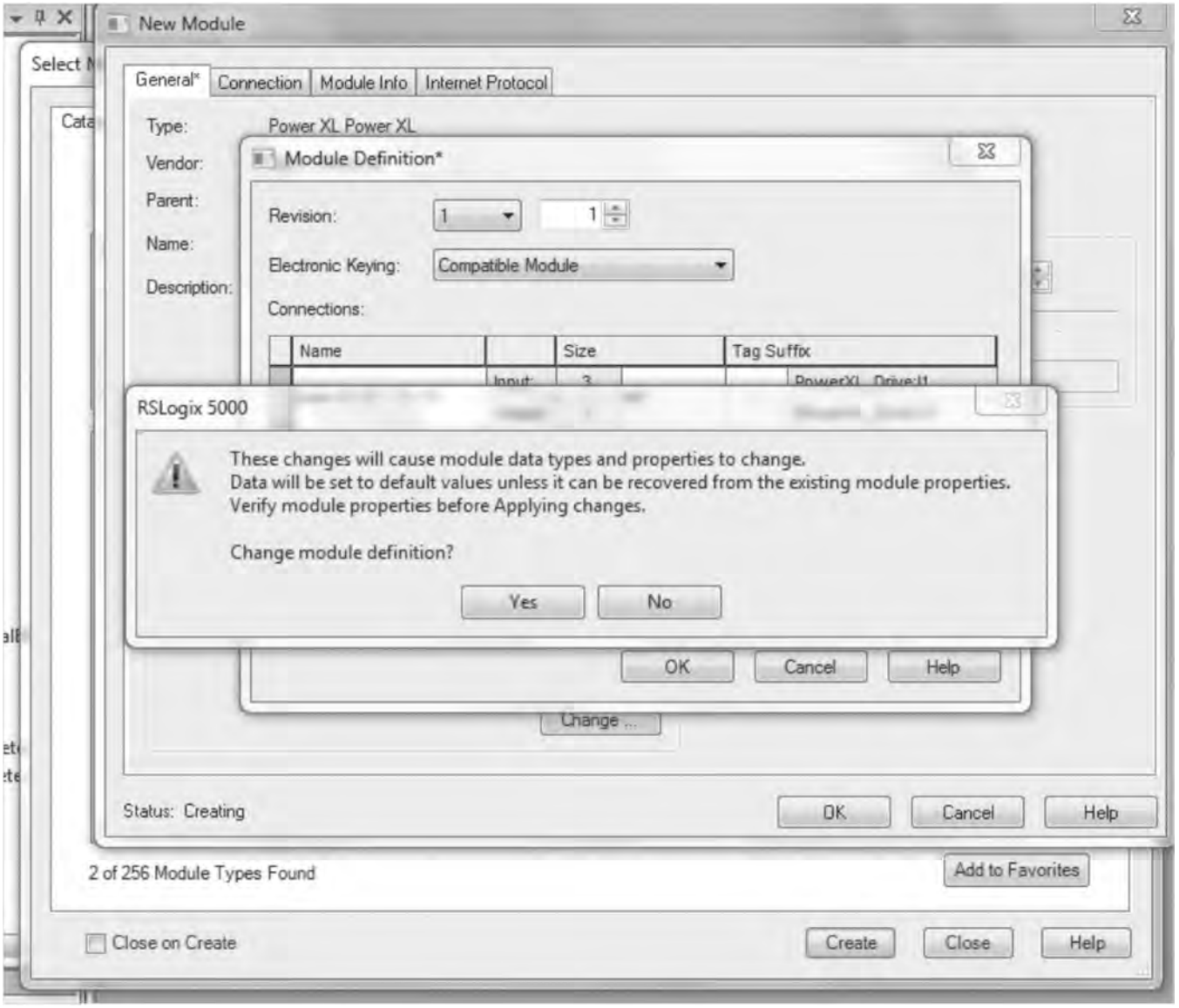
Choose the INT data type then select /IO connection from the provided list. After selecting desired I/O assembly instance connection, information related to it will appear.



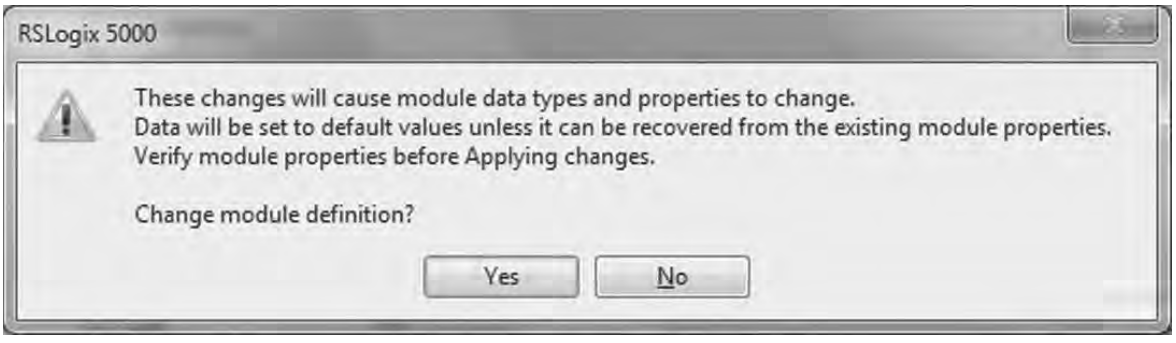
After selecting the I/O connection, click "OK." For this example, I/O connection ASM23OT-73TO will be used. The module definition window will then look as follows.



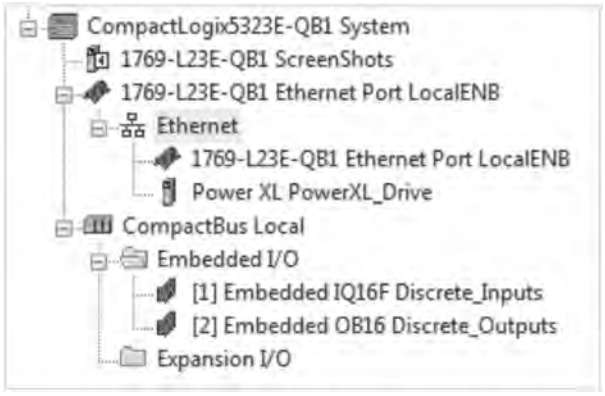
After pressing "OK," the following warning will pop-up. Press "Yes."



Warning snapshot.



Then select "OK" on the New Module Window and the PowerXL DG1 Series drive will be added to the EtherNet/IP Network on the left, in this case under the CompactLogix EtherNet/IP master port as shown.



Close the Select Module Type window or add more devices to the Network.

Select the controller tags to view the three INT input and output tags for the drive. The layout for the three input and output INTs for input assembly 73 and output assembly 23 are shown later in this section.

Name	Value	Force Mask	Style	Data Type
+ Local:1:C	{...}	{...}		AB:Embedded_IQ16F:C:0
+ Local:1:I	{...}	{...}		AB:Embedded_IQ16F:I:0
+ Local:2:C	{...}	{...}		AB:Embedded_OB16:C:0
+ Local:2:I	{...}	{...}		AB:Embedded_OB16:I:0
+ Local:2:O	{...}	{...}		AB:Embedded_OB16:O:0
− PowerXL_Drive:I1	{...}	{...}		_0044:PowerXL_BD7BDD2...
PowerXL_Drive:I1.ConnectionFaulted	0		Decimal	BOOL
− PowerXL_Drive:I1.Data	{...}	{...}	Decimal	INT[3]
+ PowerXL_Drive:I1.Data[0]	0		Decimal	INT
+ PowerXL_Drive:I1.Data[1]	0		Decimal	INT
+ PowerXL_Drive:I1.Data[2]	0		Decimal	INT
− PowerXL_Drive:O1	{...}	{...}		_0044:PowerXL_B82B6E11:
− PowerXL_Drive:O1.Data	{...}	{...}	Decimal	INT[3]
+ PowerXL_Drive:O1.Data[0]	0		Decimal	INT
+ PowerXL_Drive:O1.Data[1]	0		Decimal	INT
+ PowerXL_Drive:O1.Data[2]	0		Decimal	INT

Eaton also provides a tag generation tool that generates I/O tags for your Eaton EtherNet/IP slave devices. This software tool generates a CSV file containing all the I/O tags that can then be imported into RSLogix5000. These tags are automatically aliased to the generic I/O tags created by RSLogix5000. The generic tags shown above for the PowerXL DG1 drive are an example.

This means you will not have to type any data into the Controller tags area for your Eaton EtherNet/IP products. The imported tags will match the layouts for the I/O assemblies chosen and displayed later in this section and can be used directly in your programs. This tool and a user manual can be downloaded from the Eaton website at the following link:

www.eaton.com/software

Note: The drive auto senses when a master polls it for valid I/O assemblies. There is no configuration necessary in the drive with regard to I/O assemblies or data lengths.

EtherNet/IP

Overview

EtherNet/IP (Ethernet/Industrial Protocol) is a communication system suitable for use in industrial environments. EtherNet/IP allows industrial devices to exchange time-critical application information. These devices include simple I/O devices such as sensors/actuators, as well as complex control devices such as robots, programmable logic controllers, welders, and process controllers. EtherNet/IP uses CIP (Control and Information Protocol), the common network, transport, and application layers also shared by ControlNet and EtherNet/IP. EtherNet/IP then makes use of standard Ethernet and TCP/IP technology to transport CIP communications packets. The result is a common, open application layer on top of open and highly popular Ethernet and TCP/IP protocols.

EtherNet/IP messaging forms.

- Unconnected messaging is used for connection establishment and for infrequent, low-priority messages
- Connected messaging uses resources that are dedicated in advance to a particular purpose such as real-time I/O data transfer

EtherNet/IP messaging connections.

- Explicit messaging connections are general purpose point-to-point connections. Messages are sent through TCP protocol
- Implicit (I/O data) connections are established to move application-specific I/O data at regular intervals. They are often set up as one-to-many relationships in order to take full advantage of the producer-consumer multicast model. Implicit messages are sent through UDP protocol

AC/DC drive profile

In order to provide compatibility between similar devices from different manufacturers, there a defined "standard" in which those devices.

- Exhibit the same behavior
- Produce and/or consume the same basic set of I/O data
- Contain the same basic set of configurable attributes. The formal definition of this information is known as a device profile.

EDS File

EDS—Is the abbreviation for Electronic Data Sheet, a file on disk that contains configuration data for specific device types. You can provide configuration support for your device by using a specially formatted ASCII file, referred to as the EDS.

The information in an EDS allows configuration tools to provide informative screens that guide a user through the steps necessary to configure a device. An EDS provides all of the information necessary to access and alter the configurable parameters of a device. This information matches the information provided by instances of the parameter object class. The CIP object library describes the parameter object class in detail.

Explicit messaging

Explicit Messaging is used in commissioning and parameterizing of the EtherNet/IP board. Explicit messages provide multipurpose, point-to-point communication paths between two devices. They provide the typical request/response-oriented network communication used to perform node configuration and problem diagnosis. Explicit messages typically use low priority identifiers and contain the specific meaning of the message right in the data field. This includes the service to be performed and the specific object attribute address.

Note: If Class 1 connection (cyclic data) has been established, then explicit messages cannot be used to control output data. However, this restriction doesn't apply for IO Data reading.

List of object classes

The communication interface supports the following object classes.

Table 61. List of object classes

Class	Object	Remark
0x01	Identity objects	CIP required object
0x04	Assembly object	CIP object for drive device
0x06	Connection manager object	Communication object
0x28	Motor data object	CIP object for drive device
0x29	Control supervisor object	CIP object for drive device
0x2A	Ac/dc drive object	CIP object for drive device
0xA0	Vendor parameters object	CIP object for drive device—vendor specific
0xA1	Vendor parameter object	Please refer to **Appendix A**
0xA2	Vendor parameter object	Please refer to **Appendix A**
0xA3	Vendor parameter object	Please refer to **Appendix A**
0xA4	Vendor parameter object	Please refer to **Appendix A**
0xA5	MPFC parameter object	Please refer to **Appendix A**
0xF5	TCP/IP Interface Object	CIP required object
0x02	Message router object	Communication object
0xF4	Port object	Communication object
0xF6	Ethernet link object	CIP required object

List of services

The services supported by these object classes are shown below.

Table 62. Services supported by object classes

		Identity object		Connection manager		TCP/IP Interface		Ethernet link		Assembly		Motor data		Control supervisor		AC/DC drive		Vendor parameter	
Service Code (in hex)	Service Name	Class	Inst	Class	Inst	Class	Inst	Class	Inst	Class	Inst	Class	Inst	Class	Inst	Class	Inst	Class	Inst
01	Get_attributes_All	Y	Y	Y	Y	Y	Y	Y	Y										
05	Reset (Type 0 & 1)		Y												Y ①				
0E	Get_attribute_single	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y		Y		Y		Y
10	Set_attribute_single						Y				Y		Y		Y		Y		Y
4E	Forward close				Y														
52	Unconnected_send				Y														
54	Forward_open				Y														

① Control supervisor supports only reset-type 0 instance service.

List of data types

The attribute list that follows includes information on the data type of each attribute. The following tables explain the data, structure, and array type codes used in the data type column.

Following data types are supported.

Table 63. Elementary data types

Data type name	Data type code (in hex)	Data type description
BOOL	C1	Logical Boolean with values TRUE and FALSE
SINT	C2	Signed 8-bit integer value
INT	C3	Signed 16-bit integer value
USINT	C6	Unsigned 8-bit integer value
UINT	C7	Unsigned 16-bit integer value
UDINT	C8	Unsigned 32-bit integer value
BYTE	D1	Bit string–8-bit
WORD	D2	Bit string–16-bit
SHORT_STRING	DA	Character string (1 byte per character, 1 byte length indicator)
REAL	CA	32-bit floating point value
SHORT_STRING	DA	Character string (1 byte per character, 1 byte length indicator)

Table 64. Constructed data types

Type Code	Description
A1	Abbreviated array type encoding
A2	Formal structure type encoding

Reset service

The following table lists the different types of resets supported by the identity object.

Resetting the drive interface to its out-of-box configuration will change the response of the drive to a loss of communications with the master. The device will have to be re-configured for your application before resuming normal operation. Reset Time 1 sec.

Table 65. Different types of resets supported by the identity object

Value	Type of reset
0	Initializes drive to the Power-up state.
1	Writes default values to all instance attributes AND then saves all non-volatile attributes to FLASH memory AND then performs the equivalent of a Reset (0).

Common industrial objects implemented by the PowerXL DG1 EIP

Cip common required objects

Identity object, class 0x01

This object provides identification of and general information about the PowerXL DG1.

Table 66. Identity object

ID	Description	Data type	Access rule	Remarks/Default values
Class attributes				
01h	Revision	UINT	Get	1
02h	Max Instances	UINT	Get	1
03h	Number of instances	UINT	Get	1
06h	Maximum ID class attribute	UINT	Get	7
07h	Maximum ID instance attribute	UINT	Get	7
Class services				
0Eh	Get_attribute_single			
01h	Get_attribute_all			
Instance attributes				
01h	Vendor ID	UINT	Get	68 (Eaton Vendor ID)
02h	Device type	UINT	Get	CIP specified–lined to motor (AC Drive)–2
03h	Product code	UINT	Get	0x3000
04h	Revision	STRUCT of	Get	
	Major revision	USINT		
	Minor revision	USINT		
05h	Status	WORD	Get	0x34–Default
06h	Serial number	UDINT	Get	
07h	Product name	SHORT_STRING	Get	PowerXL DG1
Instance services				
01h	Get_attributes_all			
05h	Reset			Reset type 0 & 1
0Eh	Get_attribute_single			

Connection manager object, class 0x06

The connection manager class allocates and manages the internal resources associated with both I/O and Explicit Messaging Connections. The specific instance generated by the Connection Manager Class is referred to as a Connection Instance or a Connection Object.

Table 67. Connection manager object

ID	Description	Data type	Access rule	Remarks/Default values
Class attributes				
01h	Revision	UINT	Get	
02h	Max instances	UINT	Get	
03h	Number of instances	UINT		
04h	Optional attribute list	STRUCT of	Get	
	Number of optional attributes	UINT		
06h	Maximum ID	UINT	Get	
	Number class			
	Attributes			
07h	Maximum ID number	UINT	Get	
	Instance attribute			
Class services				
0Eh	Get_attribute_single			
01h	Get_attribute_all			
Instance attributes				
01h	Open requests	UINT	Get	
02h	Open format rejects	UINT	Get	
03h	Open resource rejects	UINT	Get	
04h	Open other rejects	UINT	Get	
05h	Close requests	UINT	Get	
06h	Close format requests	UINT	Get	
07h	Close other requests	UINT	Get	
08h	Connection timeouts	UINT	Get	
Instance services				
01h	Get_attributes_all			
0Eh	Get_attribute_single			
4Eh	Forward_close			
52h	Unconnected_send			
54h	Forward_open			

TCP/IP interface object, class 0XF5

The TCP/IP interface object provides the mechanism to configure a device's TCP/IP network interface. Examples of configurable items include the device's IP Address, Network Mask, and Gateway Address.

Table 68. TCP/IP interface object

ID	Description	Data type	Access rule	Remarks/Default values
Class attributes				
01h	Revision	UINT	Get	3
02h	Max instance	UINT	Get	1
03h	Number of instances	UINT	Get	1
04h	Optional attribute list	Array of UINT	Get	0x04 0x00 0x08 0x00 0x09 0x00 0x0A 0x00 0x0B 0x00
06h	Maximum ID class attribute	UINT	Get	7
07h	Maximum ID instance attribute	UINT	Get	0x0B
Class services				
01h	Get_attributes_all			
0Eh	Get_attribute_single			
Instance attributes				
01h	Status	DWORD	Get	01
02h	Configuration capability	DWORD	Get	0xD4
03h	Configuration control	DWORD	Get/Set ①	02-dhcp, 0- static
04h	Physical link	STRUCT of	Get	
	Path size	UINT		00
	Path	Padded EPATH		00
05h	Interface configuration	Struct of:-NV	Get/Set ①	
	Ip address	UDINT		192.168.1.254
	Network mask	UDINT		255.255.255.0
	Gateway address	UDINT		192.168.1.1
	Name server	UDINT		00
	Name server 2	UDINT		00
	Domain name	STRING		00
06h	Host name	STRING	Get/Set ①	00
08h	TTL value	USINT	Get	01
09h	Multicast configuration	Struct of	Get	
	Alloc control	USINT		00
	Reserved	USINT		00
	Number of mcast	UINT		0x20
	Starting multicast address	DWORD		0xA0 0x20 0xC0 0xEF
0Ah	Select ACD	BOOL	Get/Set ①	1
0Bh	Last conflict detected	Struct of	Get/Set ①	
	ACD activity	USINT		0
	Remote MAC	Array of 6 USINT		00
	ARP PDU	Array of28 USINT		00
Instance services				
01h	Get_attributes_all			
0Eh	Get_attribute_single			
10h	Set_attribute_single			

① Set service is applicable only in Static IP addressing Mode.

Note: Attribute configuration control supports only value 0 (device is using configuration values that are stored in non-volatile memory). Attribute host name is used just for information purposes.

Ethernet link object class 0XF6

The Ethernet link object maintains link-specific counters and status information for an IEEE® 802.3 communications interface.

Table 69. Ethernet link object

ID	Description	Data type	Access rule	Remarks/Default values
Class attributes				
01h	Revision	UINT	Get	3
02h	Max instance	UINT	Get	1
03h	Number of instances	UINT	Get	1
04h	Optional attribute list	Struct of:	Get	
	Number of attributes	UINT		0x04 0x00
	Array of attributes	Array of UINT		0x07 0x00 0x08 0x00 0x09 0x00 0x0A 0x00
06h	Maximum ID class attribute	UINT	Get	0x07
07h	Maximum ID instance attribute	UINT	Get	0x0A
Class services				
01h	Get_attributes_all			
0Eh	Get_attribute_single			
Instance attributes				
01h	Interface speed	UDINT	Get	0x64 0x00 0x00 0x00
02h	Interface flags	DWORD	Get	0x2D
03h	Physical	ARRAY of	Get	
	Address	6 USINTs		
06h	Interface control	Struct of:	Get	
	Control bits	WORD		01
	Forced interface speed	UINT		00
07h	Interface type	USINT	Get	02
08h	Interface state	USINT	Get	01
09h	Admin state	USINT	Get/Set	01 (Other value write is invalid)
0Ah	Interface label	Short String	Get	ASCII code of “PowerXL DG1”
Instance services				
01h	Get_attribute_all			
10h	Set_attribute_single			
0Eh	Get_attribute_single			

Objects present in an AC/DC drive.

Assembly object class 0X04

Table 70. Assembly Object

ID	Description	Data type	Access rule	Remarks/Default values
Class attributes				
01h	Revision	UINT	Get	2
02h	Max instance	UINT	Get	0x7F
03h	Number of instances	UINT	Get	0x0E
04h	Optional attribute list	Struct of:	Get	
	Number of attributes	UINT		01
	Array of attributes	Array of UINT		04 00
06h	Maximum ID class attribute	USINT	Get	07 00
07h	Maximum ID instance attribute	USINT	Get	04 00
Class services				
0Eh	Get_attribute_single			
Instance attributes				
03	Data	ARRAY of BYTES	Get/Set	
Instance services				
10h	Set_attribute_single			
0Eh	Get_attribute_single			

Motor data object, class 0x28

Table 71. Motor data object

ID	Description	Data type	Access rule	Remarks/Default Values/Min./Max.
Class attributes				
01	Revision	UINT	Get	1
02	Max instance	UINT	Get	3
03	Number of instances	UINT	Get	3
Class services				
0Eh	Get_attribute_single			
Instance 1 attributes				
03h	Motor type	USINT-V	Get	Squirrel cage induction motor (7)
06h	Rated current	UINT	Get	126,1,5000
07h	Rated voltage	UINT	Get	380,180,690
09h	Rated frequency	UINT	Get	50,30,400
0Ch	Pole count	UINT	Get	4,1,8
0Fh	Base speed	UINT	Get	1440,300,20000
Instance 2 attributes				
03h	Motor type	USINT-V	Get	Squirrel cage induction motor (7)
06h	First rated current	UINT-NV	Get/Set	126,1,5000
07h	First rated voltage	UINT-NV	Get/Set	380,180,690
09h	First rated frequency	UINT-NV	Get/Set	50,30,400
0Ch	Pole count	UINT	Get	4,1,8
0Fh	First base speed	UINT-NV	Get/Set	1440,300,20000
Instance 3 attributes				
03h	Motor type	USINT-V	Get	Squirrel cage induction motor (7)
06h	Second rated current	UINT-NV	Get/Set	120,1,5000
07h	Second rated voltage	UINT-NV	Get/Set	380,180,690
09h	Second rated frequency	UINT-NV	Get/Set	50,30,400
0Ch	Pole count	UINT	Get	4,1,8
0Fh	Second base speed	UINT-NV	Get/Set	1440,300,20000
Instance services				
0Eh	Get_attribute_single			
10h	Set_attribute_single			

Control supervisor object, class 0x29

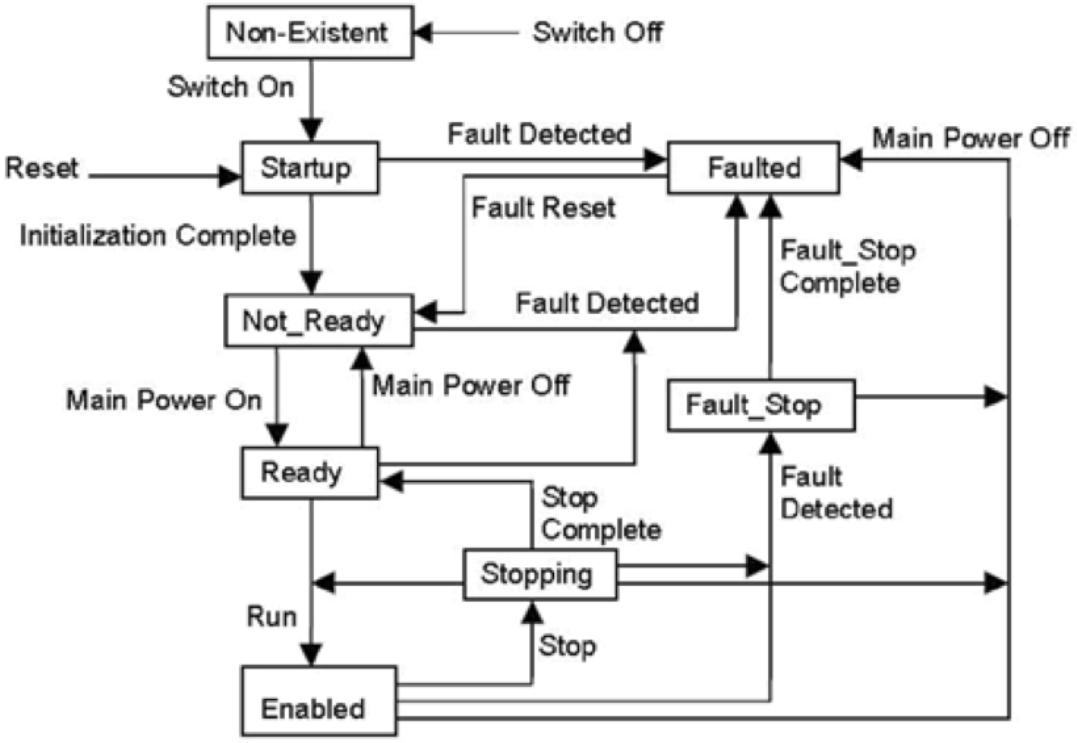
Table 72. Control supervisor object

ID	Description	Data type	Access rule	Default	Range
Class Attributes					
01h	Revision	UINT	Get	1	—
02h	Max instance	UINT	Get	1	—
03h	Number of instances	UINT	Get	1	—
Class Services					
0Eh	Get_attribute_single				
Instance Attributes					
03h	Run1 (RunForward)	BOOL	Get/Set	0	0–1
04h	Run2 (RunReverse)	BOOL	Get/Set	0	0–1
05h	NetCtrl	BOOL	Get/Set	0	0–1
06h	State	USINT	Get	0	0–7
07h	Running1	BOOL	Get	0	0–1
08h	Running2	BOOL	Get	0	0–1
09h	Ready	BOOL	Get	0	0–1
0Ah	Faulted	BOOL	Get	0	0–1
0Bh	Warning	BOOL	Get	0	0–1
0Ch	FaultRst	BOOL	Get/Set	0	0–1
0Fh	CtrlFromNet	BOOL	Get	0	0–1
0Dh	Active fault code ①	UINT	Get	0	0–65535
6Ch	Comm idle action value	BOOL	Get/Set	2	0–2
6Dh	Comm timeout	UINT	Get/Set	10 sec	0-60sec
Instance Services					
0Eh	Get_attribute_single				
10h	Set_attribute_single				
05h	Reset (Type 0)			Type 0	

① See **Appendix C** for list of Fault Codes.

Note: When both Run (Run1 & Run2) attributes set, then no action.

Figure 27. State transition diagram



AC/DC drive object, class 0x2a

This object models the functions specific to an AC or DC Drive, e.g., speed ramp, torque control, and so on.

Table 73. Motor data object

ID	Description	Data type	Access rule	Default
Class attributes				
01h	Revision	UINT	Get	1
02h	Max instance	UINT	Get	1
03h	Number of instances	UINT	Get	1
Class services				
0Eh	Get_attribute_single			
Instance attributes				**Default, Min./Max.**
03h	AtReference	BOOL	Get	0
04h	NetRef	BOOL	Get/Set	0
06h	DriveMode	USINT	Get	0
07h	Speed Actual	INT	Get	0
08h	SpeedRef	INT	Get/Set	0
0Bh	Torque Actual	INT	Get	0
0Ch	TorqueRef	INT	Get/Set	0
1Dh	RefFromNet	BOOL	Get	0
12h	Accel time	UINT	Get	468,1,46875
13h	Decel time	UINT	Get	468,1,46875
0Ah	Currentlimit	INT-NV	Get/Set	345
64h	Accel time 1	UINT-NV	Get/Set	468,1,46875
65h	Accel time 2	UINT-NV	Get/Set	468,1,46875
66h	Decel time 1	UINT-NV	Get/Set	468,1,46875
67h	Decel time 2	UINT-NV	Get/Set	468,1,46875
1Ch	Time scale	SINT-NV	Get/Set	6,0,127
Instance services				**Default**
0Eh	Get_attribute_single			
10h	Set_attribute_single			

Note: Final Accel Time = Accel Time 1 x (2 to power Time Scale).

Vendor parameters object, class 0xA0, 0xA1, 0xA2, 0xA3, 0xA4 and 0xA5

PowerXL DG1 Series shall support Vendor Parameters Object, Class 0xA0, 0xA1, 0xA2, 0xA3, 0xA4 and 0xA5 as given in table below.

Vendor parameter object is used in order to get access to drive parameters.

Please refer to **Appendix A** for Class, Instance, and Attribute values for each parameter.

Table 74. Vendor specific objects

ID	Description	Data type	Access rule	Remarks/default
Class attributes				
01h	Revision	UINT	Get	1
02h	Max instance	UINT	Get	1
03h	Number of instances	UINT	Get	Varies for different objects
Class services				
0Eh	Get_attribute_single			
Instance attributes				
	Varies for different objects			
Instance services				
0Eh	Get_attribute_single			
10h	Set_attribute_single			

Note: All the drive parameters given in the application manual are accessible using the vendor parameter object. See **Appendix A** for instance values.

Assembly instances implemented by PowerXL DG1 EtherNet/IP

Assemblies 20, 21, 23 & 25 ODVA AC/DC profile; assemblies 70, 71, 73 & 75 ODVA AC/DC profile; assemblies >100, Eaton profile.

Output instances

Assembly instance 20

Table 75. Instance 20 (Output) length = 4 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0						FaultReset		RunFwd
1								
2	Speed reference (Low Byte), rpm							
3	Speed reference (High Byte), rpm							

Assembly instance 21

Table 76. Instance 21 (Output) length = 4 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		NetRef	NetCtrl			FaultReset	RunRev	RunFwd
1								
2	Speed reference (Low Byte), rpm							
3	Speed reference (High Byte), rpm							

Assembly instance 23

Table 77. Instance 23 (Output) length = 6 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		NetRef	NetCtrl			FaultReset	RunRev	RunFwd
1								
2	Speed reference (Low Byte), rpm							
3	Speed reference (High Byte), rpm							
4	Torque reference (Low Byte), Nm ①							
5	Torque reference (High Byte), Nm ①							

① Torque Reference is sent to the Drive only if Motor Control Mode is set to "Torque Control".

Note: Torque Reference is sent to the Drive as a Process Data 1.

Assembly instance 25

Table 78. Instance 25 (Output) length = 6 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		NetRef	NetCtrl			FaultReset	RunRev	RunFwd
1								
2	Speed reference (Low Byte), rpm							
3	Speed reference (High Byte), rpm							
4	Process reference (Low Byte) ①							
5	Process reference (High Byte)							

① In Speed control Mode—Process Ref is Process Data IN8 (Analog Input 1).
In Freq. control—Process Ref is Process Data IN8 (Analog Output 1, reading the actual output current.).
In Torque control—Process Ref is Process Data IN1 (Torque Reference).
Based on selection of AO, process reference value will be sent on AO out.

Assembly instance 101

Table 79. Instance 101 (Output) length = 8 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		NetRef	NetCtrl	FB DATAIN 2	FB DATAIN 1	FaultReset	RunRev	RunFwd
1	PDSELB3	PDSELB2	PDSELB1	PDSELB0	PDSELA3	PDSELA2	PDSELA1	PDSELA0
2	FBSpeed reference (Low Byte), rpm							
3	FBSpeed reference (High Byte), rpm							
4	FBProcessDataIn1 (Low Byte)							
5	FBProcessDataIn1 (High Byte)							
6	FBProcessDataIn2 (Low Byte)							
7	FBProcessDataIn2 (High Byte)							

Note: Process data is sent to the drive independently from the NetRef and NetCtrl bits settings.

Byte 1 of the 101 Output assembly selects which Process Data out selection is read back to the EIP scanner. Bytes 4 through 7 of the 101 Output assembly are application specific.

Select the Multi-purpose application to read data other than what is set as default Process Data.

Default Fieldbus Process data out selections 1 through 8 are:

1 = Output frequency (hertz)
2 = Motor Speed (rpms)
3 = Motor Current (amps)
4 = Motor Torque (% of nominal motor torque)
5 = Motor Power (% of nominal motor power)
6 = Motor Voltage (Calculated motor voltage)
7 = DC Bus Voltage
8 = Active Fault Code

Multipurpose has a "Fieldbus" group where you reference the FBProcessDataOUT1 through FBProcessDataOUT8 selections. Referring to the 101/107 I/O assembly sheet, bits PDSELx0–PDSELx3 in each "nibble" of Byte 1 of Output Assembly 101 are used to select which FBProcessDataOUT (1–8) you "read" back to your PLC. That is integer 1 through 8 converted to binary Bit 0 through Bit 3. Any parameter or monitored value can be read using the Multi-purpose application, as long as it references a specific ID number. Whichever ProcessDataOutput selector used from 1 through 8 dictates what bits are used in Byte 1 of the output assembly 101. Values are then sent via Input Assembly 107 in Bytes 4 and 5 and Bytes 6 and 7 respectively. If all PDSELxx values are zero, the "Drive state" will be selected at Byte1 location of 107 assembly.

Speed Reference commands for Instances 20, 21, 23, 25 and 101 are set up to send the RPM value. This value is sent based off the Motor Nameplate setting provided in the drive. This would be the direct RPM value written.

Assembly instance 111

Table 80. Instance 111 (Output) length = 20 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		NetRef	NetCtrl	FB DATAIN 2	FB DATAIN 1	FaultReset	Direction	Run
1	NA							
2	FBSpeedReference (Low Byte) ①							
3	FBSpeedReference (High Byte) ①							
4	ProcessDataIn1 (LowByte)							
5	ProcessDataIn1 (HighByte)							
6	ProcessDataIn2 (LowByte)							
7	ProcessDataIn2 (HighByte)							
8	ProcessDataIn3 (LowByte)							
9	ProcessDataIn3 (HighByte)							
10	ProcessDataIn4 (LowByte)							
11	ProcessDataIn4 (HighByte)							
12	ProcessDataIn5 (LowByte)							
13	ProcessDataIn5 (HighByte)							
14	ProcessDataIn6 (LowByte)							
15	ProcessDataIn6 (HighByte)							
16	ProcessDataIn7 (LowByte)							
17	ProcessDataIn7 (HighByte)							
18	ProcessDataIn8 (LowByte)							
19	ProcessDataIn8 (HighByte)							

① This is the reference1 to the frequency converter. Used normally as Speed reference. The allowed scaling is 0 to 10000. In the application, the value is scaled in percentage of the frequency area between set minimum and maximum frequency. (0 = 0.00%–10000 = 100.00%).

Input instances

Assembly instance 70

Table 81. Instance 70 (Input) length = 4 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0						Running1		Faulted
1								
2	Speed Actual (Low Byte), rpm							
3	Speed Actual (High Byte), rpm							

Assembly instance 71

Table 82. Instance 71 (Input) length = 4 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2	Running1	Warning	Faulted
1	Drive State ①							
2	Speed Actual (Low Byte), rpm							
3	Speed Actual (High Byte), rpm							

① Refer "State transition diagram," provided under "Control Supervisor Object" and "Drive State" table specified at end of "Input Instances" section.

Drive State	
0x00	DN_NON_EXISTANT
0x01	DN_STARTUP
0x02	DN_NOT_READY
0x03	DN_READY
0x04	DN_ENABLED
0x05	DN_STOPPING
0x06	DN_FAULT_STOP
0x07	DN_FAULTED

Assembly instance 73

Table 83. Instance 73 (Input) length = 6 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2	Running1	Warning	Faulted
1	Drive state ①							
2	Speed actual (Low Byte), rpm							
3	Speed actual (High Byte), rpm							
4	Torque actual (Low Byte), Nm							
5	Torque actual (High Byte), Nm							

① See note 1 from **Table 82** on **Page 64**.

Assembly instance 75

Table 84. Instance 75 (Input) length = 6 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2	Running1	Warning	Faulted
1	Drive state ①							
2	Speed actual (Low Byte), rpm							
3	Speed actual (High Byte), rpm							
4	Process actual (Low Byte), Nm ②							
5	Process actual (High Byte), Nm							

① See note 1 from **Table 82** on **Page 64**.
② Process actual value is same as process reference. This value will be a 0 to 10000 (100.00%) for use with Analog outputs writing, 0 = 0 or 4 mA and 10000 being 20 mAs.

Assembly instance 107

Table 85. Instance 107 (Input) length = 8 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2	Running1	Warning	Faulted
1	Drive State/Processdata Selector Value (if pd selector is used) ①							
2	% Speed actual (Low Byte) ②							
3	% Speed actual (High Byte) ②							
4	Process DataOut1 (Low Byte)							
5	Process DataOut1 (High Byte)							
6	Process DataOut2 (Low Byte)							
7	Process DataOut2 (High Byte)							

① See note 1 from **Table 82** on **Page 64**.
② Speed Actual. This is the actual value from the frequency converter. The value is between 0 and 10000. In the application, the value is scaled in percentage of frequency area between set minimum and maximum frequency. (0 = 0.00%–10000 = 100.00%).

Note: See info on Assembly 101 for varying values in the Process Data Out 1 and Process Data Out 2 Bytes. See **Appendix B** on default Process Data info.

Assembly instance 117

Table 86. Instance 117 (input). EIP drive status length = 34 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	CtrlFromNet	At zero speed	AtReference	Alarm/Warning	Faulted	Direction	Running	Ready
1	NA							
2	% Speed actual (Low Byte) ①							
3	% Speed actual (High Byte) ①							
4	RPM speed actual (Low Byte) ②							
5	RPM speed actual (High Byte) ②							
6	Reserved							
7	Reserved							
8	Reserved							
9	Reserved							
10	Reserved							
11	Reserved							
12	Reserved							
13	Reserved							
14	Reserved							
15	Reserved							
16	Reserved							
17	Reserved							
18	ProcessDataOut1 (LowByte)							
19	ProcessDataOut1 (HighByte)							
20	ProcessDataOut2 (LowByte)							
21	ProcessDataOut2 (HighByte)							
22	ProcessDataOut3 (LowByte)							
23	ProcessDataOut3 (HighByte)							
24	ProcessDataOut4 (LowByte)							
25	ProcessDataOut4 (HighByte)							
26	ProcessDataOut5 (LowByte)							
27	ProcessDataOut5 (HighByte)							
28	ProcessDataOut6 (LowByte)							
29	ProcessDataOut6 (HighByte)							
30	ProcessDataOut7 (LowByte)							
31	ProcessDataOut7 (HighByte)							
32	ProcessDataOut8 (LowByte)							
33	ProcessDataOut8 (HighByte)							

① This is the actual value from the frequency converter. The value is between 0 and 10000. In the application, the value is scaled in percentage of frequency area between set minimum and maximum frequency. (0 = 0.00%–0000 = 100.00%).

② The RPM Speed Actual is the actual speed of the motor. The unit is RPM.

Note: See **Appendix B** for Process Data Value defaults.

Assembly instance 127

Table 87. Instance 127 (Input). EIP drive status length = 20 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	CtrlFromNet	At zero speed	AtReference	Alarm/Warning	Faulted	Direction	Running	Ready
1	NA							
2	% Speed actual (Low Byte) ①							
3	% Speed actual (High Byte) ①							
4	ProcessDataOut1 (LowByte)							
5	ProcessDataOut1 (HighByte)							
6	ProcessDataOut2 (LowByte)							
7	ProcessDataOut2 (HighByte)							
8	ProcessDataOut3 (LowByte)							
9	ProcessDataOut3 (HighByte)							
10	ProcessDataOut4 (LowByte)							
11	ProcessDataOut4 (HighByte)							
12	ProcessDataOut5 (LowByte)							
13	ProcessDataOut5 (HighByte)							
14	ProcessDataOut6 (LowByte)							
15	ProcessDataOut6 (HighByte)							
16	ProcessDataOut7 (LowByte)							
17	ProcessDataOut7 (HighByte)							
18	ProcessDataOut8 (LowByte)							
19	ProcessDataOut8 (HighByte)							

① This is the actual value from the frequency converter. The value is between 0 and 10000. In the application, the value is scaled in percentage of frequency area between set minimum and maximum frequency. (0 = 0.00%–10000 = 100.00%).

Note: See **Appendix B** for Process Data Value defaults.

Table 88. Instance 128 (Input). EIP drive status length = 20 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2	Running1	Warning	Faulted
1	Drive state							
2	% Speed actual (Low Byte) ①							
3	% Speed actual (High Byte) ①							
4	ProcessDataOut1 (LowByte)							
5	ProcessDataOut1 (HighByte)							
6	ProcessDataOut2 (LowByte)							
7	ProcessDataOut2 (HighByte)							
8	ProcessDataOut3 (LowByte)							
9	ProcessDataOut3 (HighByte)							
10	ProcessDataOut4 (LowByte)							
11	ProcessDataOut4 (HighByte)							
12	ProcessDataOut5 (LowByte)							
13	ProcessDataOut5 (HighByte)							
14	ProcessDataOut6 (LowByte)							
15	ProcessDataOut6 (HighByte)							
16	ProcessDataOut7 (LowByte)							
17	ProcessDataOut7 (HighByte)							
18	ProcessDataOut8 (LowByte)							
19	ProcessDataOut8 (HighByte)							

① This is the actual value from the frequency converter. The value is between 0 and 10000. In the application, the value is scaled in percentage of frequency area between set minimum and maximum frequency. (0 = 0.00%–10000 = 100.00%).

BACnet MS/TP—On-Board Communication

BACnet stands for Building Automation and Control Networks. It is the common name for the communication standard ISO 16484-5 which defines the methods and the protocol for cooperating building automation devices to communicate. Devices can be designed to operate using BACnet communication protocol as well as utilizing BACnet protocol to communicate between systems. BACnet is an internationally accepted protocol for building automation (such as lightning control, air conditioning and heating automation) and control over a communications network. BACnet provides a method by which computer-based control equipment, from different manufacturers can work together, or "interoperate." For this to be achieved, components must be able to exchange and understand BACnet data messages. Your drive is equipped with BACnet support as standard.

BACnet MS/TP specifications

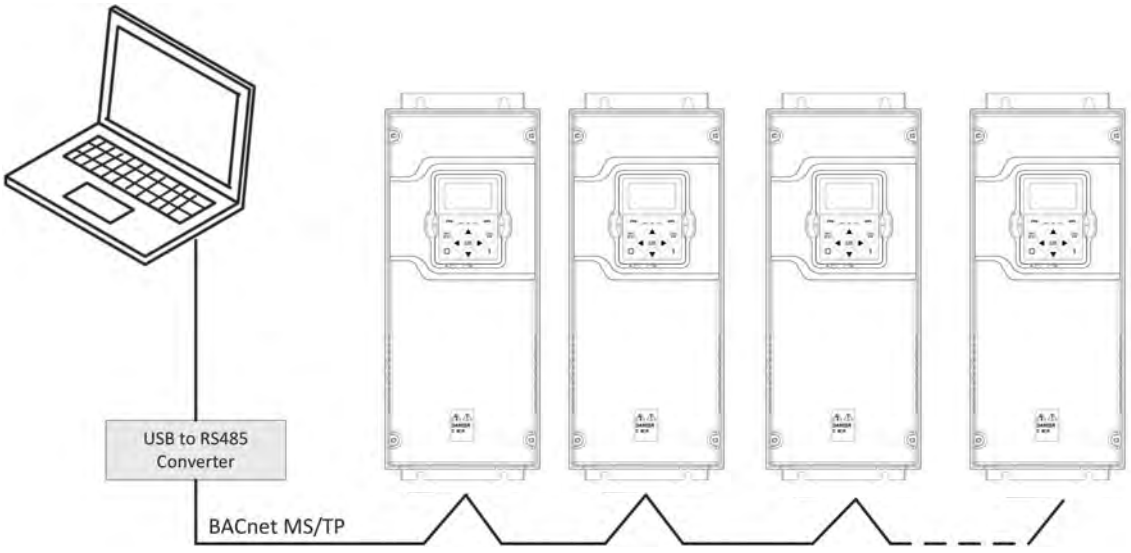
Table 89. BACnet MS/TP technical data

Item	Description
Interface	RS-485
Data transfer method	RS-485, half-duplex
Transfer cable	STP (Shielded Twisted Pair), type Belden or similar
Connection: Electrical isolation	Communication: Functional
Connection: BACnet MS/TP	Communication: As described in ANSI/ ASHRAE Standards 135-2004
Connection: Baud rate	Communication: 9600, 19200, 38400, 76800, 115200

BACnet MS/TP connections

The control board is located inside the control unit of the drive.

Figure 28. Principal example diagram



Prepare for use through MS/TP

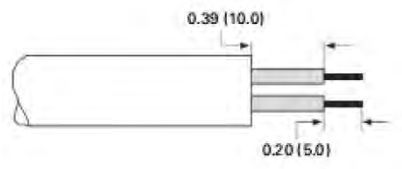
1. Open the cover of the AC drive.

⚠ WARNING

The relay outputs and other I/O-terminals may have a dangerous control voltage present even when drive is disconnected from mains.

2. Locate the components that you will need on the drive to connect and run the BACnet cables.
3. Strip about 0.59 in (15 mm) of the RS-485 cable and cut off the grey cable shield. Remember to do this for both bus cables (except for the last device). Leave no more than 0.39 in (10 mm) of the cable outside the terminal block and strip the cables at about 0.20 in (5 mm) to fit in the terminals. See illustration below.

Figure 29. Stripping the cable

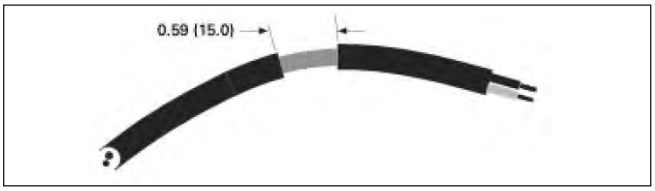


Also strip the cable now at such a distance from the terminal that you can fix it to the frame with the grounding clamp. Strip the cable at a maximum length of 0.59 in (15 mm).

⚠ IMPORTANT

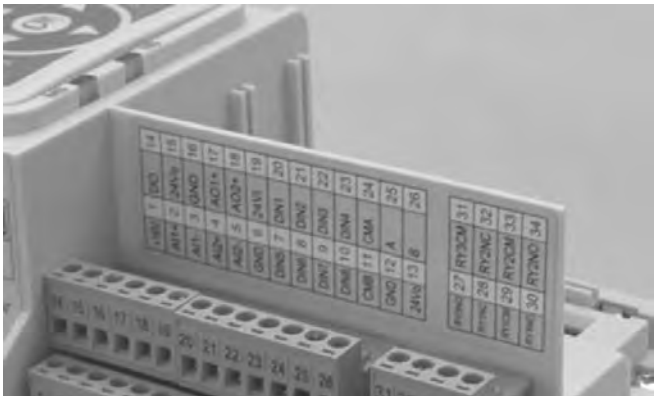
Do not strip the aluminum cable shield!

Figure 30. RS-485 Cable strip (Aluminum Shield)



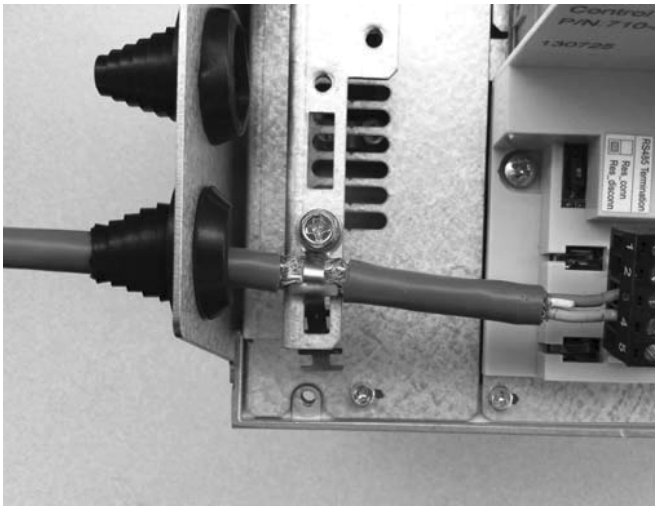
4. Then connect the cable to its appropriate terminals on the drive standard terminal block, terminals A and B (A = positive, B = negative). See illustration below.

Figure 31. Drive terminals (BACnet)



5. Using the cable clamp included in the delivery of the drive, ground the shield of the RS-485 cable to the frame of the AC drive.

Figure 32. Serial ground



6. If the drive is the last device on the bus, the bus termination must be set. Locate the DIP switches to the right of the control keypad of the drive and turn the switch for the RS-485 bus termination resistor to position ON. Biasing is built in the termination resistor. See also step 8 below.

Figure 33. RS-485 Bus termination setup

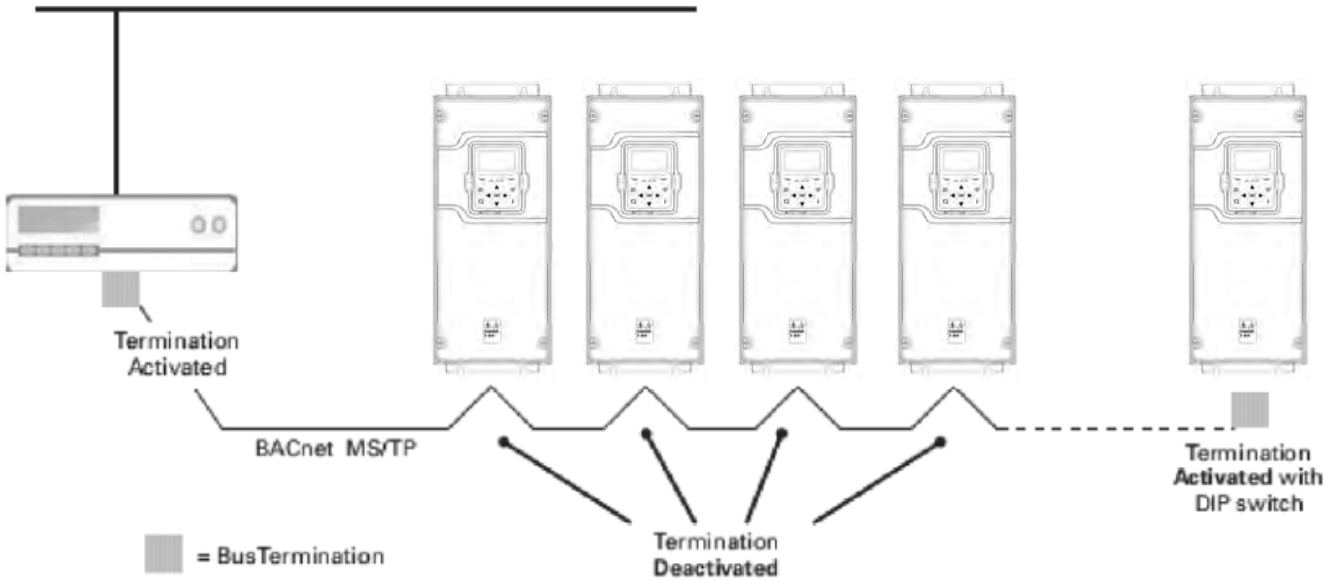
7. Remount the AC drive cover.

Note: When planning the cable runs, remember to keep the distance between the fieldbus cable and the motor cable at a minimum of 11.81 in (30 cm).

8. The bus termination must be set for the first and last device of the fieldbus line. See illustration below. See also step 6 above. We recommend that the first device on the bus terminated is the Master device.

BACnet MS/TP bus termination

Figure 34. BACnet bus termination



Commissioning

BACnet programming

The navigation path to the fieldbus parameters may differ from application to application. The exemplary paths below apply to the drive.

Figure 35. PowerXL DG1 BACnet MSTP parameter navigation

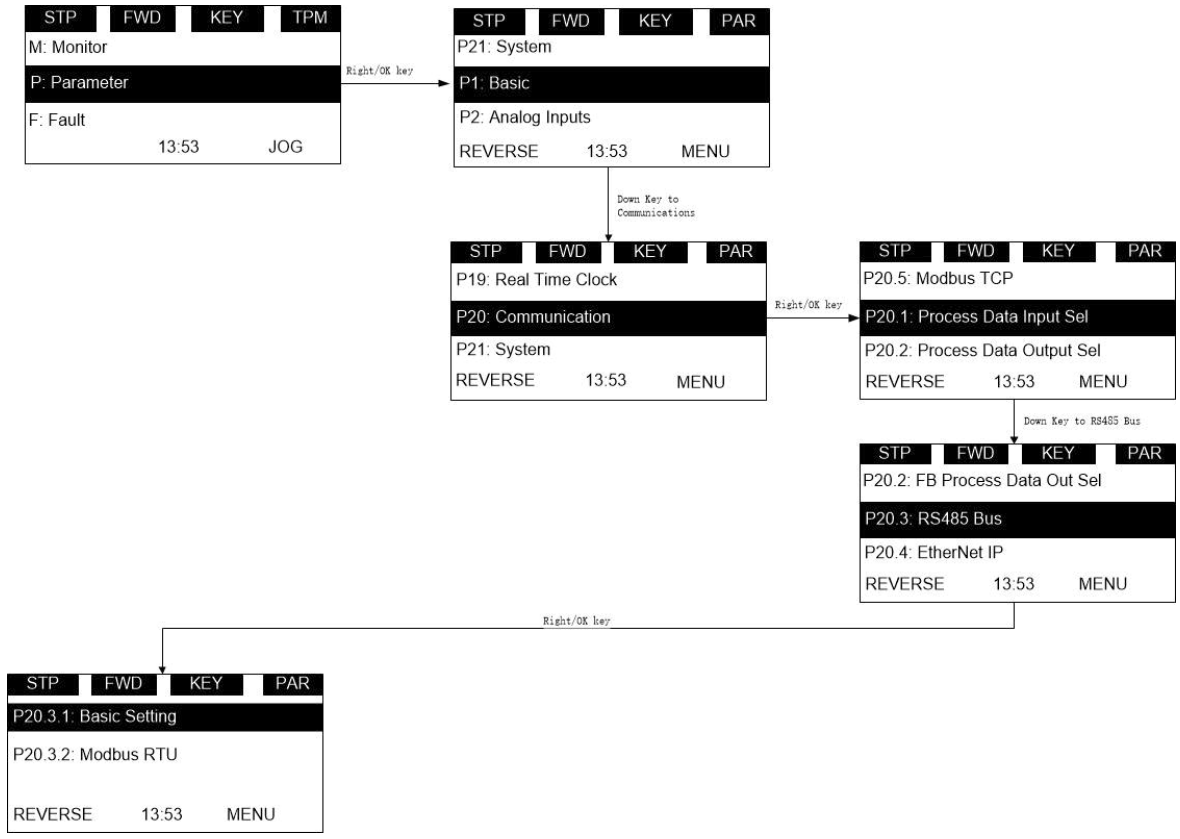
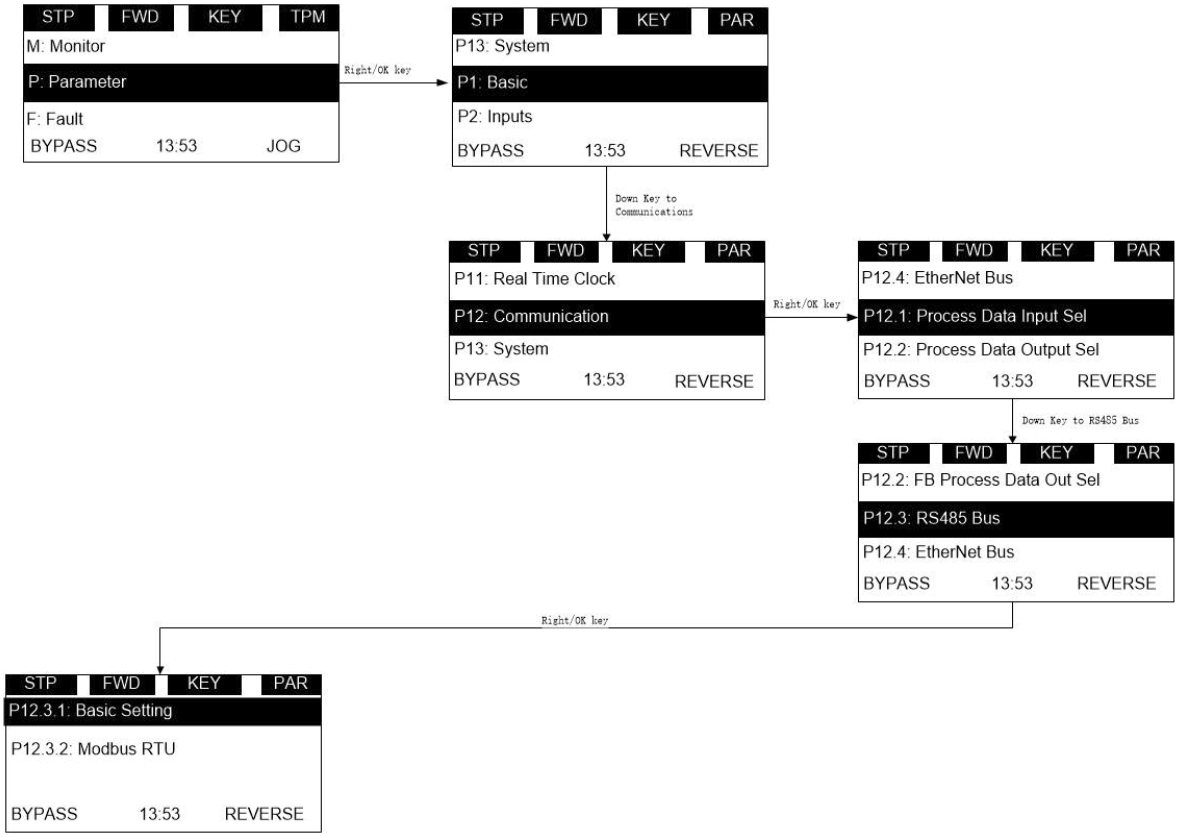


Figure 36. PowerXL DH1 BACnet MSTP parameter navigation



1. First ensure that the right fieldbus protocol is selected.

Navigate:

Main Menu ⟶ Parameter ⟶ Communication ⟶ RS485 Bus ⟶ RS-485 Comm Set ⟶ Edit ⟶ (Choose Protocol as BACnet MS/TP)

BACnet MS/TP Parameters and monitoring values

Table 90. BACnet MS/TP Parameter Table

DG1 code	DH1 code	Parameter	Min.	Max.	Unit	Default	ID	Note
P20.3.1.1	P12.3.1.1	RS485 Comm Set				0	586	0 = Modbus RTU 1 = BACnet MS/TP
P20.3.3.1	P12.3.3.1	BACnet Baud Rate				2	594	0 = 9600 1 = 19200 2 = 38400 3 = 768000 4 = 115200
P20.3.3.2	P12.3.3.2	MAC Address	0	127		1	595	
P20.3.3.3	P12.3.3.3	Instance Number	0	4194302		varies	596	
P20.3.3.4	P12.3.3.4	Comm Timeout BACnet			ms	10000	598	
P20.3.3.5	P12.3.3.5	Protocol Status				0	599	0 = Stopped 1 = Operational 2 = Faulted
P20.3.3.6	P12.3.3.6	Fault Code				0	600	0 = None 1 = Sole Master
P20.3.3.7	P12.3.3.7	Modbus RTU/BACNet Fault Response	0	1		0	2516	0 = In Fieldbus Control 1 = in all Control
—	P12.3.3.8	Max Master	0	127		127	1537	

BACnet MS/TP parameters

Baud Rate

Select the communication speed for the network. The default value is 38400 baud.

MAC address

The parameters of every device must be set before connecting to the bus. Especially the parameters MAC Address and baud rate must be the same as in the master's configuration. The first parameter, MAC (Medium Access Control) address, must be unique on the network to which it is connected. The same MAC address may be used on a device on another network within the internetwork. Addresses 128–254 are reserved for slaves. Addresses 1–127 are valid for both masters and slaves. The portion of the address space that is actually used for masters in a particular installation is determined by the value of the Max_Master property of the device object. It is recommended that MAC address 0 be reserved for the MS/TP router and MAC address 255 is used for broadcasts.

Instance number

The Device Object's Instance number is used in conjunction with the MAC address to assign the devices on the network. The instance number can have up to 127 nodes on it before a different instance number is required.

Communication time-out

BACnet board initiates a communication error if the board is a "sole master" in the network for a time defined with this parameter.

BACnet overview

BACnet technical data

Protocol Implementation Conformance Statement (PICS)

Controller Profile

- B—ASC

Segmentation Capability

- Not supported

Data Link Layer and Routing Options

- MS/TP Master Baud rates (9600,19200,38400, 76800, 115200)

Character Sets Supported

- UTF8

BIBBS Supported

- Data Sharing
  - ReadProperty—B
  - WriteProperty—B
- Device Management
  - Dynamic Device Binding—B
  - Dynamic Object Binding—B
  - DeviceCommunicationControl—B
  - ReinitializeDevice—B
- Alarms and Events: Not supported
- Schedules: Not supported
- Trends: Not supported
- Network Management: Not supported

Table 91. Supported object types and properties summary

Property	Device object type	Analog input object type	Analog value object type	Binary value object type	Multiple state value object type
Active_Cov_Subscriptions					
Active_Text				X	
Active_Vt_Sessions					
Alarm_Value					
Alarm_Values					
Align_Intervals					
Apdu_Segment_Timeout					
Apdu_Timeout	X				
Application_Software_Version	X				
Auto_Slave_Discovery					
Backup_And_Restore_State					
Backup_Failure_Timeout					
Backup_Preparation_Time					
Change_Of_State_Count					
Change_Of_State_Time					
Configuration_Files					
Cov_Increment					
Database_Revision	X				
Daylight_Savings_Status					
Deadband					
Description	X	X	X	X	X
Device_Address_Binding	X				
Device_Type					
Elapsed_Active_Time					
Event_Algorithm_Inhibit					
Event_Algorithm_Inhibit_Ref					
Event_Detection_Enable					
Event_Enable					
Event_Message_Texts					
Event_Message_Texts_Config					
Event_State		X	X	X	X
Event_Time_Stamps					
Fault_Values					
Firmware_Revision	X				
High_Limit					
Inactive_Text				X	
Interval_Offset					
Last_Restart_Reason					
Last_Restore_Time					
Limit_Enable					
Local_Date					
Local_Time					

Table 91. Supported object types and properties summery, continued

Property	Device object type	Analog input object type	Analog value object type	Binary value object type	Multiple state value object type
Location					
Low_Limit					
Manual_Slave_Address_Binding					
Max_Apdu_Length_Accepted	X				
Max_Info_Frames	X				
Max_Master	X				
Max_Pres_Value					
Max_Segments_Accepted					
Min_Pres_Value					
Minimum_Off_Time					
Minimum_On_Time					
Model_Name	X				
Notification_Class					
Notify_Type					
Number_Of_Apdu_Retries	X				
Number_Of_States					X
Object_Identifier	X	X	X	X	X
Object_List	X				
Object_Name	X	X	X	X	X
Object_Type	X	X	X	X	X
Out_Of_Service		X	X	X	X
Password ①	X				
Present_Value		X	X	X	X
Priority_array			X	X	
Profile_Name	X				
Protocol_Object_Types_supported	X				
Protocol_Revision	X				
Protocol_Services_Supported	X				
Protocol_Version	X				
Reliability					
Reliability_Evaluation_Inhibit					
Relinquish_Default			X	X	
Resolution					
Restart_Notification_Recipients					
Restore_Completion_Time					
Restore_Preparation_Time					

① Password is a vendor specific property added to device object with property identifier as 600. Default value of password is empty string; this is a writable property with max length of 20, it always returns ***** on read. Same password will be used for Reinitialize Device Service and Device communication Control service.

Table 91. Supported object types and properties summery, continued

Property	Device object type	Analog input object type	Analog value object type	Binary value object type	Multiple state value object type
Segmentation_Supported	X				
Serial_Number	X				
Slave_Address_Binding					
Slave_Proxy_Enable					
State_Text					X
Status_Flags		X	X	X	X
Structured_Object_list					
System_Status	X				
Time_Delay					
Time_Delay_Normal					
Time_Of_Active_Time-reset					
Time_Of_Device_Restart					
Time_Of_State_Count_Reset					
Time_Synchronization_Interval					
Time_Synchronization_Recipients					
Units		X	X		
Update_Interval					
Utc_Offset					
Utc_Time_Synchronization_Recipients					
Vendor_Identifier	X				
Vendor_Name	X				
Vt_Classes_Supported					

Object instance summary

Binary Value Object Instance Summary

The following table summarizes the Binary Value Objects supported.

Table 92. Binary value object instance summary

Instance ID	Object name (related To drive parameter)	Description	Inactive/Active text	Preset value access
BV0	Ready State	Indicates whether the drive is ready or not	Not Ready/Ready	R
BV1	Run/Stop State	Indicates whether the drive is running or stopped	Stop/Run	R
BV2	Fwd/Rev State	Indicates the rotation direction of motor	Fwd/Rev	R
BV3	Fault State	Indicates if a fault is active	OK/Fault	R
BV4	Warning State	Indicates if a warning is active	OK/Warning	R
BV5	At Setpoint	Ref. Frequency reached	False/True	R
BV6	At Zero Speed	Motor Running at zero speed	False/True	R
BV7	Motor Ctrl source	Command to change active source for controlling motor	LocalMotorCtrl / FBMotorCtrl	C
BV8	Speed Reference Source	Command to change source of motor speed reference	LocalSpeedRef / FBSpeedRef	C
BV9	Run/Stop CMD	Command to start drive	Stop/Run	C
BV10	Fwd/Rev CMD	Command to change rotational direction	Fwd/Rev	C
BV11	Reset Fault	Command to reset active Fault from drive	0/Reset	C
BV12	Digital Input 1	Digital Input 1	OFF/ON	R
BV13	Digital Input 2	Digital Input 2	OFF/ON	R
BV14	Digital Input 3	Digital Input 3	OFF/ON	R
BV15	Digital Input 4	Digital Input 4	OFF/ON	R
BV16	Digital Input 5	Digital Input 5	OFF/ON	R
BV17	Digital Input 6	Digital Input 6	OFF/ON	R
BV18	Digital Input 7	Digital Input 7	OFF/ON	R
BV19	Digital Input 8	Digital Input 8	OFF/ON	R
BV20	Digital Output 1	Digital Output 1	OFF/ON	R
BV21	Digital Output 2	Relay 1 Output	OFF/ON	R
BV22	Digital Output 3	Relay 2 Output	OFF/ON	R
BV23	Digital Output 4	Relay 3 Output	OFF/ON	R
BV24	Stop By Coast	Indicates if drive stop by coast	ON/OFF	C
BV25	Stop By Ramp	Indicates if drive stop by Ramp	OFF/ON	C
BV26	Belt Broken	Indicates If belt is broken	OFF/ON	R
BV27	Drive Fan Failure	Indicates if Drive Fan failed	OFF/ON	R
BV28	Force Bypass	Command to take Drive in Bypass Mode	OFF/ON	C
BV29	Fire Mode	Enable Fire Mode	OFF/ON	C
BV30	DIN 1	Fieldbus Digital Input	OFF/ON	C
BV31	DIN 2	Fieldbus Digital Input	OFF/ON	C
BV32	DIN 3	Fieldbus Digital Input	OFF/ON	C
BV33	DIN 4	Fieldbus Digital Input	OFF/ON	C

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable.

Commandable values support priority arrays and relinquish defaults.

Analog value object instance summary

The following table summarizes the Analog Value Objects supported.

Table 93. Analog value object instance summary

Instance ID	Object name	Description	Units	Preset value access
AV0	Speed Reference	Motor speed reference from network	Percent	C
AV1	Current Limit	Current Limit	Amps	W
AV2	Min Frequency	Minimum Frequency	Hz	W
AV3	Maximum Frequency	Maximum Frequency	Hz	W
AV4	Accel Time 1	Acceleration Time	seconds	W
AV5	Decel Time 1	Deceleration Time	seconds	W
AV6	AnyParam ID	Parameter ID number to be accessed	No Units	W
AV7	AnyParam Value	Value of parameter defined by AV6	No Units	W
AV8	Process Data In 1	Fieldbus Process Data In 1	NA	C
AV9	Process Data In 2	Fieldbus Process Data In 2	NA	C
AV10	Process Data In 3	Fieldbus Process Data In 3	NA	C
AV11	Process Data In 4	Fieldbus Process Data In 4	NA	C
AV12	Process Data In 5	Fieldbus Process Data In 5	NA	C
AV13	Process Data In 6	Fieldbus Process Data In 6	NA	C
AV14	Process Data In 7	Fieldbus Process Data In 7	NA	C
AV15	Process Data In 8	Fieldbus Process Data In 8	NA	C

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays and relinquish defaults.

Table 94. Analog Input object instance summary

Instance ID	Object name	Description	Units	Preset value access
AI0	Frequency Setpoint	Frequency Setpoint	Hz	R
AI1	Output Frequency	Output Frequency	Hz	R
AI2	Motor Speed	Motor Speed	Rpm	R
AI3	Motor Load	Motor Load	Percent	R
AI4	Kilowatt Hours total	Kilowatt Hour Counter (Total) scaled by 1000	KWh	R
AI5	Motor Current	Motor Current	Amps	R
AI6	DC link Voltage	DC link Voltage	Volts	R
AI7	Motor Voltage	Motor Voltage	Volts	R
AI8	Unit Temperature	Heatsink Temperature	°C	R
AI9	Motor Torque	In % of motor nominal Torque	Percent	R
AI10	Operating Days	Operating Days (resettable)	Day	R
AI11	Operating Hours	Operating Hours (resettable)	Hour	R
AI12	Motor Temperature	Motor Temperature	Percent	R
AI13	Analog Input 1	Analog Input 1	Volts	R
AI14	Analog Input 2	Analog Input 2	Volts	R
AI15	Analog Output 1	Analog Output 1	Volts	R
AI16	Analog Output 2	Analog Output 2	Volts	R
AI17	Kilowatt Instantaneous	Kilowatt Instantaneous	KW	R

Note: For Present Value Access Types, R = Read-only.

Table 94. Analog Input object instance summary, continued

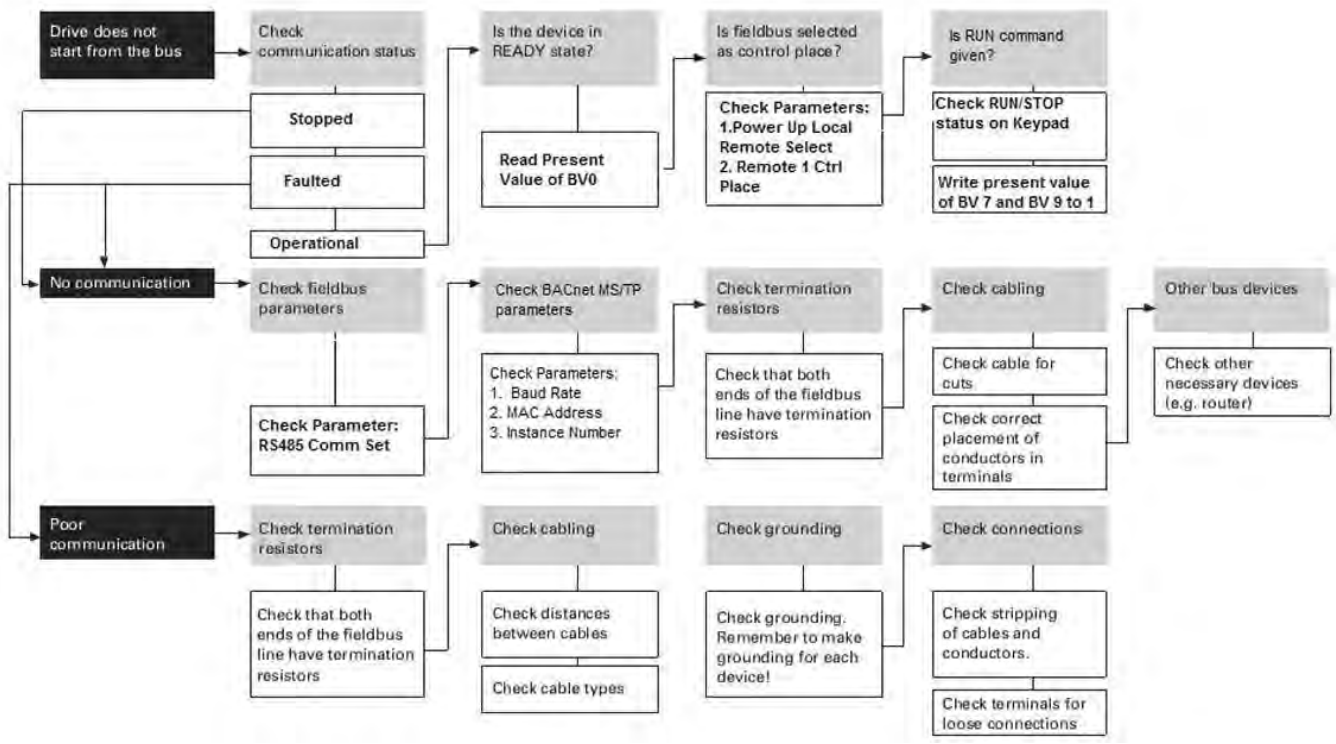
Instance ID	Object name	Description	Units	Preset value access
AI18	Process Data Out 1	Fieldbus Process Data Out 1	NA	R
AI19	Process Data Out 2	Fieldbus Process Data Out 2	NA	R
AI20	Process Data Out 3	Fieldbus Process Data Out 3	NA	R
AI21	Process Data Out 4	Fieldbus Process Data Out 4	NA	R
AI22	Process Data Out 5	Fieldbus Process Data Out 5	NA	R
AI23	Process Data Out 6	Fieldbus Process Data Out 6	NA	R
AI24	Process Data Out 7	Fieldbus Process Data Out 7	NA	R
AI25	Process Data Out 8	Fieldbus Process Data Out 8	NA	R

Note: Line length depends on different transmission speeds.

Table 95. Multi state object instance summary

Instance ID	Object name	Description	State text	Preset value access
MV0	Control mode	Indicates the drive control mode - local, remote or off	0 Local(Hand) / 1 – Remote / 2 - OFF	R
MV1	Active fault code	Indicates the latest active fault code of the drive	State text w.r.t the active fault code	R

Figure 37. Fault tracing



PROFIBUS-DP External Communication Cards

PowerXL Series can be connected to the PROFIBUS® DP using an optional PROFIBUS communication card. PowerXL Series drive can be controlled, monitored and programmed from the Host system. The devices are connected in a bus structure. There is a max of 32 stations (master or slave) can be connected to one segment bus. The bus is terminated at beginning and end of each segment. To ensure error-free operation, both bus terminations must always be powered, if more than 32 stations are used, repeaters are required.

PROFIBUS specifications

Table 96. PROFIBUS technical data

Items	Value
Terminal	DB9 connector (Female) or 5.00 mm connector (male)
Data transfer method	RS-485 half-duplex
Cable	Twisted pair (1 pair and shield)
Isolation	500 Vdc
Protocol	PROFIBUS-DP-V1
DOIO type	ST1 Telegram
Baud rate	9.6K~12M
Addresses	2~125
Environment	
Ambient operating temperature	–10°C to +55°C
Storing temperature	–40°C to +60°C
Humidity	<95%, no condensation allowed
Altitude	Max. 1000m
Vibration	0.5G at 9–200 Hz
Safety	Fulfills EN 50178 standard

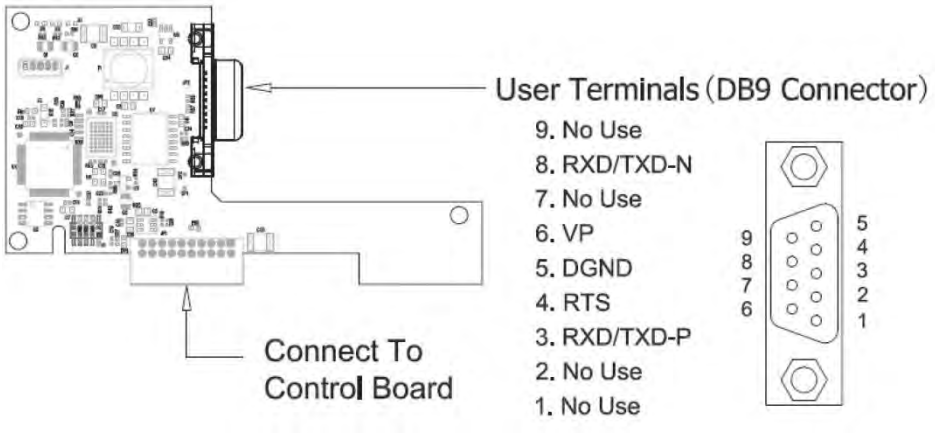
Table 97. Line length

Baud rate (kbit/s)	9.6	19.2	93.75	187.5	500	1500	3000–12000
Length line A [m]	1200	1200	1200	1000	400	200	100
Length line B [m]	1200	1200	1200	600	200	—	—

Note: Line length depends on different transmission speeds.

Hardware specifications

Figure 38. Com1 PROFIBUS card layout



LEDs

PROFIBUS LEDs are as stated below.

Table 98. PROFIBUS LEDs

ON (GREEN, the left one)	BF (RED, the middle one)	SF (RED, the right one)	Fault condition
Blinking	Blinking	Blinking	Board Initialization
ON	OFF	OFF	Everything OK
ON	ON	OFF	No communication
ON	blinking	OFF	Communication, but not in data exchange
ON	ON	ON	No communication and system fault
ON	OFF	ON	Communication and system fault

Connector On-Board

Use DB-9 connector, pin assignment as below.

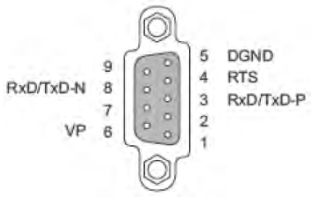


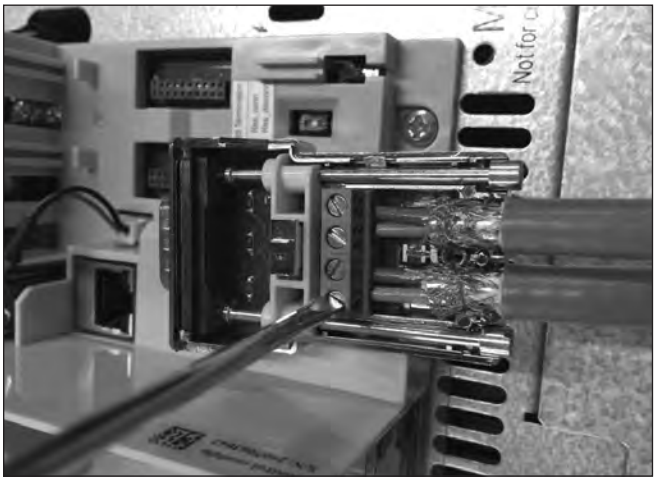
Table 99. Connector and pin assignment

Pin number	Purpose
Housing	Shield, Connected to PE
1	No use (or Shield, shield or protect GND)
2	No use (or M24, Minus 24V output Voltage)
3	RXD/TXD-P, Positive of Receive or Transmit signal
4	RTS, Request To Send
5	DGND, GND of signal (Isolated GND from RS-485 side)
6	VP, +5V, (Voltage- Plus, Isolated 5V from RS-485 side)
7	No use (or P24, Plus 24V Output Voltage)
8	RXD/TXD-N, Negative of Receive or Transmit signal
9	No use (or CNTR_N, Control-N)

Use 5.0 mm connector and pin assignment.

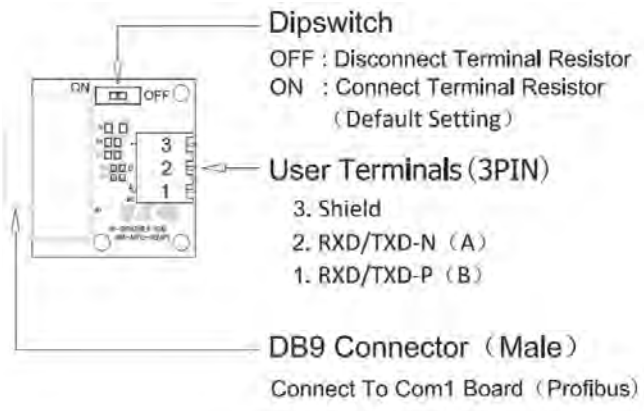
Connector on customer side

Customer side connector for DB9.



Customer side connector for 5.0 mm.

Figure 39. Com1 PROFIBUS DB9 adapter



PROFIBUS cable

Two types of cables can be used for PROFIBUS connection.

Table 100. PROFIBUS cable connections

Parameter	Line A	Line B
Impedance	135–165 Ω (3–20 MHz)	100–130 Ω (f >100 kHz)
Capacity	<30 pF/m	<60 pf/m
Resistance	<100 Ω/km	—
Wire gauge	>0.64 mm	>0.53 mm
Conductor area	>0.34 mm^2	>0.22 mm^2

Table 101. Recommended cable

Cable	Description	Part Number
Belden	PROFIBUS Data Cable	**3079A**
Olflex	PROFIBUS Cable	**21702xx**
Siemens	SINEC L2 LAN cable for PROFIBUS	**6XV1830 = 0AH0**

Commissioning

The PROFIBUS board is commissioned by inserting it into the Slot A or Slot B on the drive control board. Once the card is inserted to the slot, the device will recognize it and will show a warning for "Device Added." This warning will be shown for 5 seconds and will be cleared. Once the card is detected, the keypad will show the menu for this card in Optional Card Menu.

Optional comm cards parameters

Once the card is detected, following parameters can be set on keypad for the PROFIBUS.

Figure 40. PROFIBUS parameter menu

Table 102. PROFIBUS parameters

DG1/DH1 code	Parameter	Min.	Max.	Unit	Default	ID (Slot A/Slot B)	Note
BX.1	Monitor						
BX.1.1	Device Parameters						
BX.1.1.1	Board Status				0	883/910	B0 = Optional Comm. Card Fault
							B1 = Board HW Fault
							B2 = Reserved
							B3 = Fieldbus Fault
							B4 = Reserved
BX.1.1.2	Firmware Version					1064/1067	V1.06.0005
BX.1.1.3	Protocol Status				0	2131/2142	B0 = Waiting for Parameterization
							B1 = Parameterization Fault
							B2 = Waiting for Configuration
							B3 = Configuration Fault
							B4 = Data Exchange
BX.1.1.4	PDP-Telegram Selection	1	1		1	1244/1252	1=Standard Telegram 1
BX.1.1.5	Fault Counter PDP	0	65535				
BX.1.1.6	Fault Situations Max				8x8		
BX.1.1.7	PDP-Profil Number				341		
BX.1.1.8	PDP-Control Word	0x0000	0xFFFF				
BX.1.1.9	PDP-Status Word	0x0000	0xFFFF				
BX.1.2	Parameter Access						
BX.1.2.1	PDP-MaxBlockLength				30		
BX.1.2.2	PDP-NoOfMultiparameter				1		
BX.1.2.3	PDP-MaxLatency				2		
BX.1.3	DO Identification						
BX.1.3.1	PDP-DO Manufacturer				0x019D		
BX.1.3.2	PDP-DO Device Type				0x3000		
BX.1.3.3	PDP-DO FW-Interface						
BX.1.3.5	PDP-DO FW-DayMonth						
BX.1.3.6	PDP-DO NoOfDOs				1		
BX.1.3.7	PDP-DO Subclass				1		
BX.2	Parameters						
BX.2.1	Slave Address	2	125		118	1242/1250	Address of the PROFIBUS Slave
BX.2.1	Baud Rate	1	10		10	1243/1251	Baud Rate for PROFIBUS
							10 = Automatic
BX.2.2	Operation Mode	1	2		1	1245/1253	Operation Mode
							0 = PROFIdrive
							1 = Echo
							2 = Bypass
BX.2.3	Comm. Card FB Fault Response					2519/2520	
BX.2.4	Parameter Access	0	1		1		0=Local Control;

Table 102. PROFIBUS parameters, continued

DG1/DH1 code	Parameter	Min.	Max.	Unit	Default	ID (Slot A/Slot B)	Note
BX.2.5	Process Data Access	0	5		1		1=Fieldbus; 2=NET Control, Local Ref; 4=NET, Local on Fault; 5=NET & Local CMD;
BX.2.6	Fault Situation Counter						
BX.2.7	Parameter Sets					619	

Note: X will depend on the slot the drive is in (Slot A = 7, Slot B = 14).

The parameters of every device must be set before connecting to the bus. Especially the parameters "Slave Address" must be same as set in Master.

PROFIBUS—PowerXL Series

General

Data transfer between PROFIBUS-DP master and slave takes place via the input/output data field. The master writes to slave's output data and the slave answers by sending the contents of its inputs data to master. The content of the input/output data is defined in the device profile. The device profile for drives is PROFIdrive.

The drive can be controlled by PROFIBUS-DP Master using ST1 telegram of the PROFIdrive profile using the ST1 standard telegram in Drive profile mode, or using other modules in Bypass Mode. The Modules where Process Data values are returned can be used via the Bypass Operation mode. When Fieldbus has been selected as the active control place, the drive operation is controlled from PROFIBUS-DP Master as long as PNU927 = 1 and PNU928 = 1 by default. When these bits are disabled, it only allows monitoring values via cyclic and acyclic commands.

Operation mode

The parameter Operation Mode BX.2.4 above defines how the input/output data is handled on the option board.

PROFIdrive

Data transfer follows the document PROFIBUS Profile for variable speed drives, PROFIdrive following the Standard Telegram 1.

Echo

The OUTPUT data written by the Master is echoed back to the Master in the INPUT field.

The data is not shown in the drive, but echoing is carried out on the option board.

This mode can be used when the function of the bus connection is tested.

Bypass

The information of the Process data field is transferred to the application interface without handling.

The desired Modules define the amount of data that is transferred. Once drive is set in Bypass mode, it will give the ability to set the desired module.

PowerXL PROFIdrive interface

PowerXL has PROFIdrive profile 4.1, which allows—

- Direct control of the drive using PROFIBUS Master
- Full access to all drive parameters

Control word and status word

The Control Word and Status Word used when in Bypass mode using one of the 4 modules will follow the layout used in Modbus for the CW, SW, Ref Speed, ACT Speed, and FB Data points.

Control word

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

Table 103. Binary bits and corresponding outputs

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
①	①	①	①	①	①	FB Ref	FB Ctrl	BYS	FB DIN 4	FB DIN 3	FB DIN 2	FB DIN 1	F_RST	DIR	RUN

① 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.

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
10–15	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.

Table 104. Bypass mode process data modules

Module	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
Module 1 ①	CW	REF	FBData_In_1	FBData_In_2						
	SW	ACT	FBData_Out_1	FBData_Out_2						
Module 2 ①	CW	REF	FBData_In_1	FBData_In_2	FBData_In_3	FBData_In_4				
	SW	ACT	FBData_Out_1	FBData_Out_2	FBData_Out_3	FBData_Out_4				
Module 3 ①	CW	REF	FBData_In_1	FBData_In_2	FBData_In_3	FBData_In_4	FBData_In_5	FBData_In_6		
	SW	ACT	FBData_Out_1	FBData_Out_2	FBData_Out_3	FBData_Out_4	FBData_Out_5	FBData_Out_6		
Module 4 ①	CW	REF	FBData_In_1	FBData_In_2	FBData_In_3	FBData_In_4	FBData_In_5	FBData_In_6	FBData_In_7	FBData_In_8
	SW	ACT	FBData_Out_1	FBData_Out_2	FBData_Out_3	FBData_Out_4	FBData_Out_5	FBData_Out_6	FBData_Out_7	FBData_Out_8

① Only available in bypass mode.

Process data out

This register range is normally used to fast monitoring of the VFD. Process Data Out is located in range ID 2104–2111. See table below.

Table 105. 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	
2105	32105, 42105	FB Process Data Out 2	
2106	32106, 42106	FB Process Data Out 3	
2107	32107, 42107	FB Process Data Out 4	
2108	32108, 42108	FB Process Data Out 5	
2109	32109, 42109	FB Process Data Out 6	
2110	32110, 42110	FB Process Data Out 7	
2111	32111, 42111	FB Process Data Out 8	

Note: FB Process data is defined in **Appendix B.**

Status word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
—	—	—	—	—	—	—	—	RUNEN	BYS	AREF	WARN	FLT	DIR	RUN	RDY

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 106. 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	Not in use	Not in use
9–15	Not in use	Not In use

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 Hz.

PROFIBUS overview

PROFIBUS is a vendor independent, open fieldbus standard for a wide range of applications in manufacturing, process and building automation. Vendor independence and openness are guaranteed by the PROFIBUS standard EN 50 170. With PROFIBUS, devices of different manufactures can communicate without special interfaces adjustment. PROFIBUS can be used for both high-speed time critical data transmission and extensive complex communication tasks.

PROFIBUS-DP—Optimized for high speed and inexpensive hookup, this PROFIBUS version is designed especially for communication between automation and control systems and distributed I/O at the device level. PROFIBUS-DP can be used to replace parallel signal transmission with 24V or 0 to 20 mA.

The PROFIBUS Family—PROFIBUS specifies the technical and functional characteristics of a serial fieldbus system with decentralized digital controllers can be networked together from the field level to the cell level. PROFIBUS distinguishes between master and slave devices.

Master Devices—Determines the data communication on the bus. A master can send messages without an external request when it holds access rights (the token). Master are also called "active stations" in the PROFIBUS protocol.

Slave Devices are peripheral devices. Typical devices include input/output devices, valves, drives and measuring transmitters. They do not have bus access rights and they can only acknowledge received messages or send messages to the master when requested to do so. Slaves are also called 'passive stations".

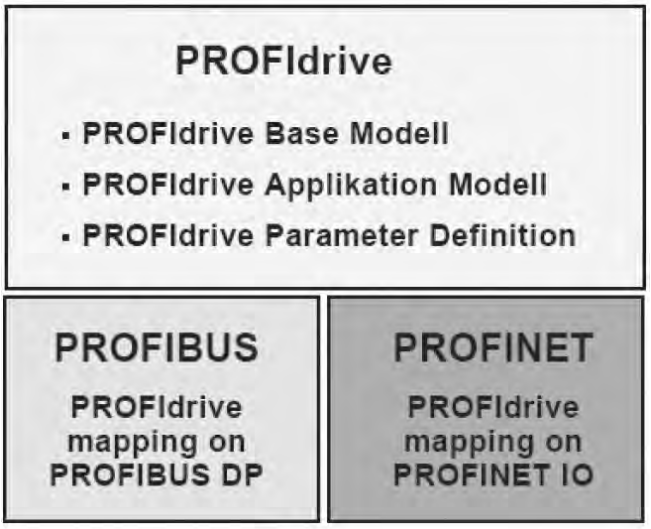
Profiles—The PROFIBUS-DP protocol defines how user data to be transmitted between stations over the bus. User data are not evaluated by the PROFIBUS transmission protocol. The meaning is specified in the profiles. In addition, the profiles specify how PROFIBUS-DP is to be used in the drives PROFIBUS Fieldbus board.

Leading manufacturers of drive technology have jointly defined the PROFIdrive profile. The profile specifies how the drives are to be parameterized and how the set points and actual values are to be transmitted. This enables drives from different vendors to be exchanged. The profile contains necessary specifications for speed control and positioning. It specifies the basic drive functions while leaving sufficient freedom for application-specific expansions and further developments. The profile describes the mapping of the application functions for DP.

PROFIdrive consists of a general part and a bus specific part. The following properties are defined in the general part.

- Base Model
- Parameter model
- Application Model

Figure 41. PROFIdrive



The PROFIdrive base model describes an automation system in terms of a number of devices and their interrelationships (application interfaces, parameter access). The base model distinguishes between following device classes.

Communication Services—Two communication services are defined in the PROFIdrive profile; namely, cyclic data exchange and acyclic data exchange.

Cyclic data exchange via a cyclic data channel

Motion control system need cyclically updated data during operation for open and closed loop control purposes. This data must be sent to the drive units in the form of set points or transmitted from the drive units in the form of actual values, via the communication systems.

Acyclic data exchange via an acyclic data channel

In addition to cyclic data exchange, there is an acyclic parameter channel for exchanging parameters between control/supervisor and drive units. Access to this data is not time critical.

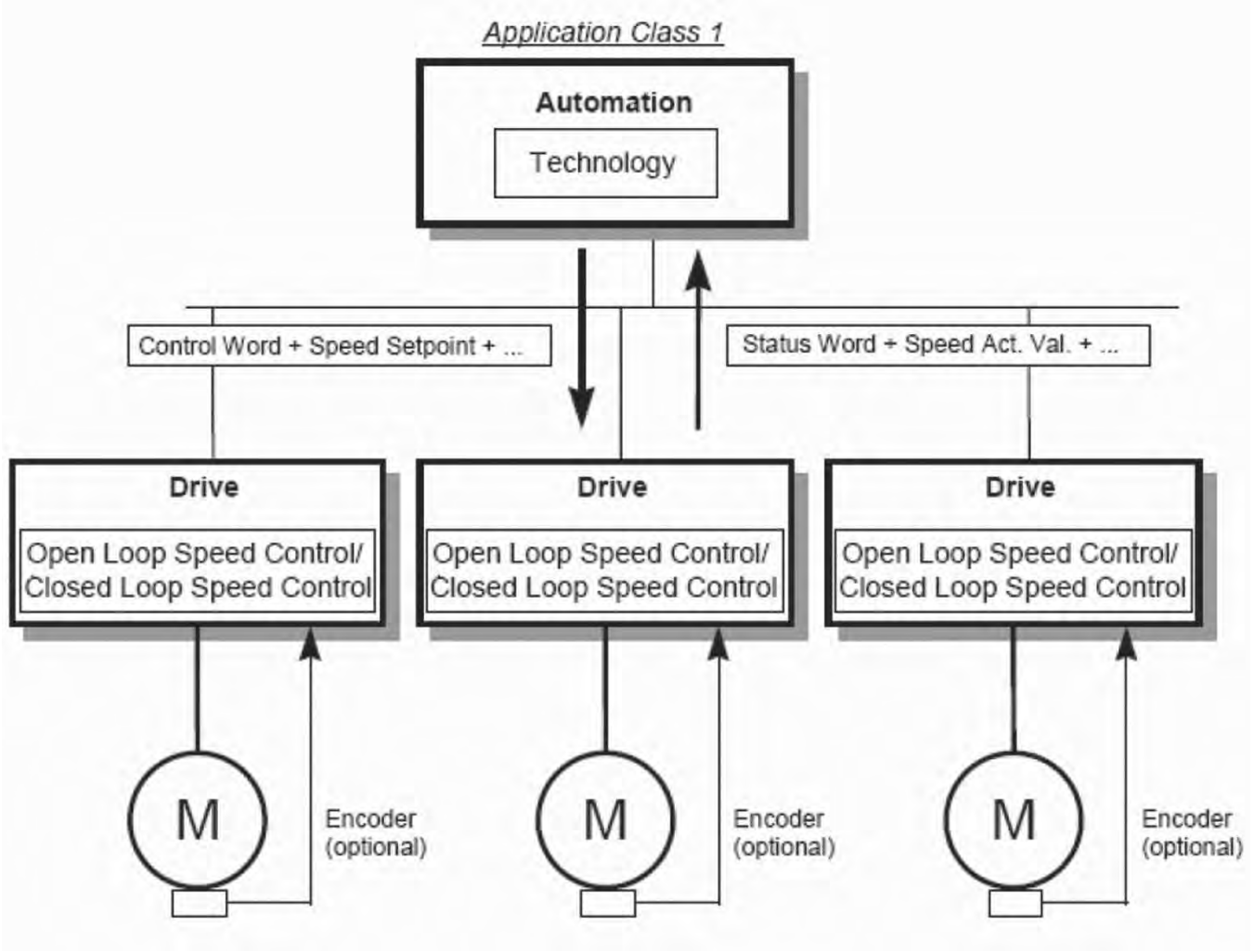
Application classes

The integration of drives into automation solutions depend strongly upon the drive task. To cover the extensive range of drive application from the most simple frequency convertor up to highly dynamic synchronized multi axis systems with a single profile. PROFIdrive defines six application categories but the drives PROFIBUS optional card support below application class 1.

Table 107. Application class

SN	Application class	Interface	Function
1	Standard Drive (e.g., pumps, fans, agitators)	n-set point	Cyclic I/O data interface

Figure 42. Application class



Startup test

Set up the communication with Master and follow below steps.

1. Complete Parameterization of the device. Below parameters are important to control device on PROFIBUS.
   a. Parameterization Enable/Disable = 1 (Enabled)
   b. Local / remote selection = 1 (Remote control)
   c. Remote 1 control place = 1 (Fieldbus)
   d. Remote 1 reference = 7 (Fieldbus Ref)
   e. PNU927-Opern priority of param = 1
   f. PNU928 Ctrl priority DOIO Data = 1
   g. ProfiBus Operation Mode = 0 (ProfiDrive)
2. Select the "Standard Telegram 1" in the Configuration step in the PLC
3. Set control word value to 0x0406 to enter ProfiDrive State S2
4. Set control word value to 0x0407 to enter ProfiDrive State S3
5. Set control word value to 0x047F and Set Frequency reference t0 0x4000 to enter ProfiDrive State S4
6. Check drive is running on output frequency 100%.
7. Set control word value to 0x047E to drive stop and ProfiDrive State S2
8. Check drive is in stop mode and output frequency 0%

Control and status words

The Control Word (PROFIBUS Parameter number (PNU) = 967) is the principal means for controlling the drive from a fieldbus system. It is sent by the fieldbus master station to the drive, the adapter module acting as a gateway.

The drive switches between its states according to the bit-coded instructions on the Control Word, and returns status information to the master in the Status Word (PROFIBUS Parameter number (PNO) = 968).

Control word 1 (STW1)

To improve the exchange of devices of different manufacturers in a control application, we strongly recommend using the device-specific bits only for the control of manufacturer specific functions. The device-specific bits shall not be necessary for the operation of a device in the speed control mode and in the positioning mode (default of the device-specific bits = 0).

Table 108. PROFIdrive control word 1—STW1 message examples

Bit	Value	Significance	Comments
0	1	ON	"Switched on" condition; voltage at the power converter, i.e. the main contact is closed (if present).
	0	OFF (OFF 1)	Power-down (the drive returns to the "ready for switching on "condition); the drive is ramped-down along the ramp (RFG) or along the current limit or along the voltage limit of the d.c. link; if standstill is detected, the voltage is isolated; the main contact is opened (if present). During deceleration bit 1 of ZSW1 is still set. An OFF command is interruptible.
1	1	No Coast Stop (no OFF 2)	All "Coast Stop (OFF2)" commands are withdrawn.
	0	Coast Stop (OFF 2)	Voltage is isolated. The main contact is then opened (if present) and the drive goes into the "Switching On Inhibited" condition; the motor coasts down to a standstill.
2	1	No Quick Stop (no OFF 3)	All "Quick Stop (OFF3)" commands are withdrawn.
	0	Quick Stop (OFF 3)	Quick stop; if required, withdraw the operating enable, the drive is decelerated as fast as possible, e.g., along the current limit or at the voltage limit of the d.c. link, at n / f = 0; if the rectifier pulses are disabled, the voltage is isolated (the contact is opened) and the drive goes into the "Switching On Inhibited" condition. A Quick Stop command is not interruptible.
3	1	Enable Operation (Start)	Enable electronics and pulses. The drive then runs-up to the set point.
	0	Disable Operation (Stop)	The drive coasts down to a standstill (ramp-function generator to 0 or tracking) and goes into the "Switched on" condition (refer to control word 1, bit 0).

Table 108. PROFIdrive control word 1—STW1 message examples, continued

Bit	Value	Significance	Comments
4	1	Enable Ramp Generator	
	0	Reset Ramp Generator	Output of the RFG is set to 0. The main contact remains closed, the converter is not isolated from the line, the drive decelerates along the current limit or along the voltage limit of the d.c. link.
5	1	Unfreeze Ramp Generator	
	0	Freeze Ramp Generator	Freeze the actual set point entered by the ramp-function generator. If Application Class 4 is used Bit 5 is not relevant.
6	1	Enable Set point	The value selected at the input of the RFG is switched-in.
	0	Disable Set point	The value selected at the input of the RFG is set to 0.
7	1	Fault Acknowledge (0⟶1)	The group signal is acknowledged with a positive edge; the drive reaction to a fault depends on the type of fault. If the fault reaction has isolated the voltage, the drive then goes into the "Switching On Inhibited" condition.
	0	No significance	
8	1	Jog 1 Ona	Prerequisite. Operation is enabled, drive is in standstill and STW1 bit 4, 5, 6 = 0. The drive runs up along the ramp of RFG to jogging set point 1.
	0	Jog 1 OFFa	Drive brakes along the ramp of RFG, if "Jog 1" was previously ON, and goes into "Operation Enabled" when drive comes to a standstill.
9	1	Jog 2 Ona	N/A
	0	Jog 2 OFFa	N/A
10	1	Control By PLC	Control via interface, DO I/O Data valid (refer to 6.3.11).
	0	No Control By PLC	DO I/O Data not valid; expect Sign-Of-Life. If loosing the control priority bit the reaction is device-specific. Possible reactions. 1) speed control. "old" process data is kept, 2) positioning. DO I/O Data are set to 0.
11	1	Device Specific	N/A
	0	Device Specific	N/A
12	1	Device Specific	N/A
	0	Device Specific	N/A
13	1	Device Specific	N/A
	0	Device Specific	N/A
14	1	Device Specific	N/A
	0	Device Specific	N/A
15	1	Device Specific	N/A
	0	Device Specific	N/A

Below is various defined control word (STW1) command.

Table 109. Control word (STW1) message examples

SN	Control word (STW1)	Control word description (STW1)	Comment
1	0x0400	Set PLC Control	PLC Control should be set in MCU
2	0x0000	Clear PLC Control	PLC Control should be reset in MCU
3	0x040F	Run Command without RFG	Motor Off as no RAMP Generator
4	0x0407	Clear Run Command	Motor Off as earlier
5	0x041F	Run Command with RFG and without Set point	Motor Off as no Set point Generator
6	0x0407	Clear Run Command	Motor Off as earlier
7	0x047F	Run Command with RFG and with Set point	Motor ON with RFG
8	0x0407	Clear Run Command	Motor Off as earlier
9	0x047F	Run Command with RFG and with Set point	Motor ON with RFG
10	0x045F	Set Freeze of Ramp	Motor ON with Ramp Freeze
11	0x047F	Clear Freeze of Ramp	Motor ON with Following Ramp Timing
12	0x047E	OFF 1 Command	Motor Off with RFG
13	0x047F	Run Command with RFG and with Set point	Motor ON with RFG
14	0x047D	OFF 2 Command (Coast Stop)	Motor Off with Coast
15	0x047F	Run Command with RFG and with Set point	Motor ON with RFG
16	0x047B	OFF 3 Command (Quick Stop)	Motor Off with 0 DECEL Time
17	0x047F	Run Command with RFG and with Set point	Motor ON with RFG
18	0x0477	Disable Operation	Motor Off with Coast
19	0x057F	Run Command with RFG and with Set point At Jog Speed	Motor ON at Jog Speed
20	0x0477	Disable Operation	Motor Off with Coast
21	0x0480	Fault Reset bit	Fault should get reset

Status word 1 (ZSW1)

Table 110. Application status word PROFIdrive

Bit	Value	Significance	Comments
0	1	Ready To Switch On	Power supply is switched on, electronics initialized, main contact, if available, has dropped out, pulses are inhibited.
	0	Not Ready To Switch On	
1	1	Ready To Operate	Refer to control word 1, bit 0.
	0	Not Ready To Operate	
2	1	Operation Enabled	Drive follows set point. This means, that the electronic and pulses are enabled (Refer to control word 1, bit 3), the closed loop control is active and controls the motor and the output of the set point channel is the input for the closed loop control.
	0	Operation Disabled	Either the pulses are disabled or the drive doesn't follow the output value of the set point channel.
3	1	Fault Present	Unacknowledged faults or currently not acknowledgeable faults (fault messages) are present (in the fault buffer). The fault reaction is fault-specific and device-specific. The acknowledging of a fault may only be successful, if the fault cause has disappeared or has been removed before. If the fault has isolated the voltage, the drive goes into the "Switching On Inhibited" condition, otherwise the drive returns to operation. The related fault numbers are in the fault buffer.
	0	No Fault	
4	1	Coast Stop Not Activated (No OFF 2)	
	0	Coast Stop Activated (OFF 2)	"Coast Stop (OFF 2)" command is present.

Status word 1 (ZSW1)

Table 110. Application status word PROFIdrive, continued

Bit	Value	Significance	Comments
5	1	Quick Stop Not Activated (No OFF 3)	
	0	Quick Stop Activated (OFF 3)	"Quick Stop (OFF 3)" command is present.
6	1	Switching On Inhibited	The drive goes only again in the "Switched On" condition with "No Coast Stop AND No Quick Stop" followed by "ON." This means that the "Switching On Inhibited" bit is only set back to zero if the OFF command is set after "No Coast Stop AND No Quick Stop."
	0	Switching On Not Inhibit	
7	1	Warning Present	Warning information present in the service/maintenance parameter; no acknowledgement.
	0	No Warning	There is no warning or the warning has disappeared again.
8	1	Speed Error Within Tolerance Range	Actual value is within a tolerance band; dynamic violations are permissible for t < tmax, e.g., n = nset±, f = fset±, etc., tmax may be parameterised
	0	Speed Error Out Of Tolerance Range	
9	1	Control Requested	The automation system is requested to assume control (refer to 6.3.11.
	0	No Control Requested	Control by the automation system is not possible, only possible at the device or by another interface.
10	1	f Or n Reached Or Exceeded	Actual value ≥ comparison value (set point) which may be set via the parameter number.
	0	f Or n Not Reached	
11	1	Device Specific	N/A
	0	Device Specific	N/A
12	1	Device Specific	N/A
	0	Device Specific	N/A
13	1	Device Specific	N/A
	0	Device Specific	N/A
14	1	Device Specific	N/A
	0	Device Specific	N/A
15	1	Device Specific	N/A
	0	Device Specific	N/A

References

References are 16-bit words containing a sign bit and a 15-bit integer. A negative reference is formed by calculating the 2's complement from the corresponding positive reference.

Table 111. References

SN	N2 data type hex	N2 data type decimal	N2 data type percentage	Frequency in decimal
1	4000	16384	100	50
2	3000	12288	74	37
3	2000	8192	50	25
4	1000	4096	24	12
5	0	0	0	0
6	F000	61440	–25	12
7	E000	57344	–50	25
8	D000	53248	–75	37
9	C000	49152	–100	50

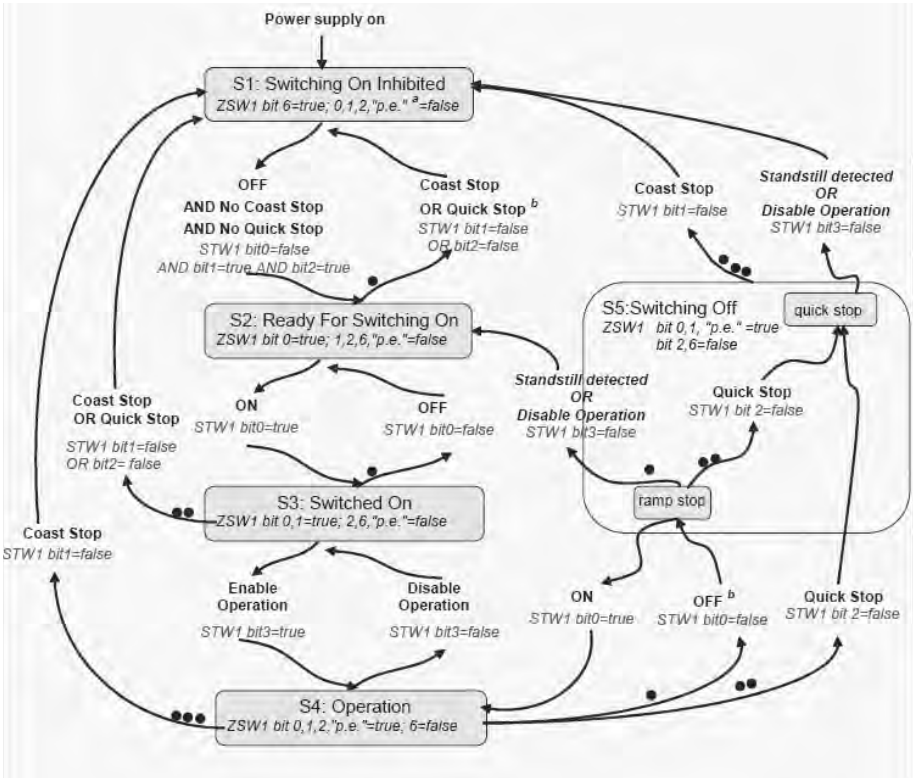
Actual values

Actual values are 16-bit words containing information on the operation of the drive. The function to be monitored are selected by a drive parameter. The scaling of the integers sent to the master as Actual Values depends on the selected function.

General state machine

State diagrams are defined for the operating modes. In the PROFIdrive control profile, the controls bits 0 to 3 perform the basic start-up / power down functions whereas the control bits 4 to 15 perform application-oriented control.

Figure 43. General state diagram



Notes: STW1 bit x, y = These control word bits shall be set by the control.

ZSW1 bit x, y = These status word bits indicate the actual state.

Standstill detected is an internal result of a stop operation.

a Abbr.: "p.e." = "Pulses enabled" optional.

b The internal condition "fault with ramp stop" also activates this transition.

Information on the general state diagram

- The green blocks represent states, the arrows represent transitions
- From several states, several transitions are possible
- The more points that a transition has, the higher is its priority. A transition without points has the lowest priority
- The PROFIBUS interfaces between this controller and the DO has the control priority (PNO 928)
- ZSW1 Bit 9 is set by the DO
- STW1 Bit 10 is set by the controller
- The bits defined for positioning mode are only relevant, if the drive is in the state "S4" operation
- All stop-reactions caused by faults (Fault with Ramp stop, Fault with Quick stop, Fault with Coast stop) for the general state machine to switch to state S1 (Switching on Inhibited) or S2 (Ready For switching)

DO I/O data

The set points to the Axis and also the actual from the Axis are transferred as DO I/O data. The DO I/O data is transferred using the cyclic data exchange. The representation of data shall be in big endian format.

The following advantages are obtained due to the telegram configuring and normalization.

- Interoperability and interchangeability of PROFIdrive Controllers and Drive Objects
- Standard components may be simply commissioned
- Automation mechanisms in the controller application

Signals

A series of signals with appropriate signal numbers is defined to configure the DO I/O Data (set points, actual values).

The following values are permissible for the signal numbers.

- 0 = not assigned
- 1-99 = standard signal numbers (profile-specific signal numbers)
- 100-65535 = signal numbers (device-specific)

The PowerXL PROFIBUS optional card, the defined signal numbers are listed in the following.

Table 112. PROFIBUS option Card

Signal no.	Significance	Abbreviation	Length
1	Control word 1	STW1	16
2	Status word 1	ZSW1	16
5	Speed set point A	NSOLL_A	16
6	Speed actual value A	NIST_A	16

Standard telegram 1

Standard telegrams 1 is defined for speed set point interface operations application class (AC1). The standard telegrams are selected when configuring the DO I/O Data.

The standard telegram 1 has the following structure.

- n set interface, 16 bit

Table 113. Standard telegram 1

I/O Data Number	Set point	Actual value
1	STW1	ZSW1
2	NSOLL_A	NIST_A

PROFIdrive Profile

The PROFIdrive profile PNU numbers are listed in **Appendix A** of this manual.

DPV1 acyclic communication

Base model parameter access, whose structure is defined in the PROFIdrive profile 4.2, is always used for communicating the writing/reading parameters for PROFIdrive drives.

Under this arrangement, parameters access always consists of two elements. Under this arrangement, parameter access always consists of two elements.

Write request ("Write data set ")
Read request ("Read data set")

Write request or Request can be send via DPV1 master class 1 or master class 2.

The DP V1 command/response part is used for the standard DP V1 read/Write on the Slot 0, Index47 data block.

Parameter requests and parameter responses

A parameter consists of three segments.

Request header

ID for the request and number of parameters which are accessed. Multi-Axis and Modular drives, Addressing of one DO.

Parameter address

Addressing of a parameter. If parameters are accessed, there are correspondingly many parameter addresses but can only be accessed on a single case. The parameter address appears only in the request, not in the response.

Parameter value. Per addressed parameter, there is a segment for the parameter values. Depending on the request ID, parameter values appear only either in the request or in the reply.

Words and double words

The following telegram contents are displayed in words (a word or 2 bytes per line). Words or double words will have the most significant byte being transmitted first (big endian).

Table 114. Words and Double Words

Word	Byte 1	Byte 2
Double Word	Byte 1	Byte 2
	Byte 3	Byte 4

According to the Base Model Parameter access the structure of the parameter request and parameter response as shown in **Table 116** and **Table 117**.

Table 115. Base mode parameter request

Block definition	Byte n	Byte n +1	n
Request Header	Request reference	Request ID 0	0
	Axis-No. / DO-ID	No. of parameters = i	2
1st Parameter address	Attribute	No. of elements	4
	Parameter number (PNU)		
	Subindex		
ith Parameter address	...		4 + 6 × (i-1)
1st Parameter value(s) (only for requst "change parameter")	Format	No. of values	4 + 6 × i
	Value		
	...		
ith Parameter value	...		
			4 + 6 × i + ... + (Format_n x Qty_n)

Table 116. Base model response

Block definition	Byte n	Byte n +1	n
Response header	Request Ref. mirrored	Response ID	0
	Axis-No. / DO-ID mirrored	No. of parameters = i	2
1st Parameter Value (s) (only after request "Request")	Format	No.of values	4
	Values or error values		
	...		
ith Parameter values	...		4 +... + (Format_n × Qty_n)

Coding

Coding of the fields in parameter request/parameter response of base model parameter access.

PROFIBUS board support only single parameter and single element.

Max No. of Parameters = 1

Max No. of Elements = 1

Max No. of Values = 1

Table 117. Field coding

Field	Data Type	Value		Comment
Request Reference	Unsigned 8	0x00	Reserved	
		0x01…0xFF		
Response ID	Unsigned 8	0x00	Reserved	
		0x01	Request parameter (+)	
		0x02	Change parameter(+)	
		0x03…0x3F	Reserved	
		0x40	INCORRECT Request Ref	
		0x41	INCORRECT Request ID	
		0x42	INVALID NOS PARAM	
		0x43	INVALID_Axis_DO_DI	
		0x44…0x7F	Manufacturer-specific	
		0x80	Reserved	
		0x81	Request parameter (–)	
		0x82	Change parameter (–)	
		0x83…0xBF	Reserved	
		0xC0…0xFF	Manufacturer-specific	
Axis/DO-ID	Unsigned 8	0x00	Device-Representative	Zero is not a DO but representative of the access to the drive unit.
		0x01…0xFE	DO-ID-Number 1–254	
		0xFF	Reserved	
No. of Parameters	Unsigned 8	0x00	Reserved	There may be an additional limitation through the communication system (telegram length) or optional scalability.
		0x01…0x27	Quantity 1–39	
		0x28…0xFF	Reserved	
Attribute	Unsigned 8	0x00	Reserved	The four less significant bits are reserved for (future) expansion of “No. of Elements” to 12 bits.
		0x10	Value	
		0x20	Description	
		0x30	Text	
		0x40…0x70	Reserved	
		0x80…0xF0	Manufacturer-specific	
No. of Elements	Unsigned 8	0x00	Special Function	Limitation through compatibility with PROFIBUS process data ASE telegram length.
		0x01…0xEA	Quality 1–234	
		0xEB…0xFF	Reserved	
Parameter Number	Unsigned 16	0x0000	Reserved	
		0x0001	Number 1–65535	
		0xFFFF		
Subindex	Unsigned 16	0x0000…	Number 0–65534	
		0xFFFF		

Table 117. Field coding, continued

Field	Data type	Value		Comment
Format	Unsigned 8	0x00	Reserved	Every slave shall at least support the data types Byte, Word and Double Word (mandatory). Write requests by the master preferable use the "correct" data types. As substitute, Byte, Word, or Double Word are also possible. The master shall be able to interpret all values/data types.
		0x01…0x36	Data types	
		0x37…0x3F	Reserved	
		0x40	Zero	
		0x41	Byte	
		0x42	Word	
		0x43	Double word	
		0x44	Error	
		0x45…0xFF	Reserved	
No. of Values	Unsigned 8	0x00…0xEA	Quantity 0–234	Limitation because of 240 Bytes Data block size (compatible with former PROFIdrive version 3.1.2).
		0xEB…0xFF	Reserved	
Error Number	Unsigned 16	0x0000…	Error numbers	The more significant byte is reserved.
		0x00FF		

Generic station description (GSD) file

Please refer GSD file "EATN0EF5.gsd"

CANopen External Communication Cards

The Eaton PowerXL DG1 series drive can be connected to the CANopen system using a fieldbus board. Through this board the drive can be controlled, monitored and programmed from the Host system. The CANopen fieldbus board can be installed in either slot A or slot B on the control board of the drive. The devices are connected in a bus structure. There is a maximum of 127 devices that can be connected to a single master. The bus termination should be made on the end of the bus segment.

CANopen technical data

Table 118. CANopen connections

Item	Value
Interface	Open style connector (Pluggable connector)
Data Transfer method	CAN (ISO 11898)
Transfer Cable	2 wire Twisted shielded cable
Electrical Isolation	500 Vdc

Table 119. Communications

Item	Value
CANopen	CiA DS-301, CiA DSP-402
Baud rate	1000 kBaud
	800 kBaud
	500 kBaud
	250 kBaud
	125 kBaud
	50 kBaud
	20 kBaud
Addresses	1–127

Table 120. Environment

Description	Specification
Ambient Operation Temperature	–10 °C to +55 °C
Storing Temperature	–40 °C to +60 °C
Humidity	<95%, no condensation allowed
Altitude	Max. 1000 M
Vibration	0.5G at 9–200 Hz
Safety	Fulfills EN 50178 Standard

CANopen cable

To meet the ISO 11898 standard, cables to be used with CANbus lines should have a nominal impedance of 120 ohms, a line delay of 5 ns/m. Line termination has to be provided through termination resistors of 120 ohms on both ends of the transmission lines. The length should be related to resistance at 70 mohm/m. There is a terminating resistor bank on all boards and can be set via the DIP switch setting.

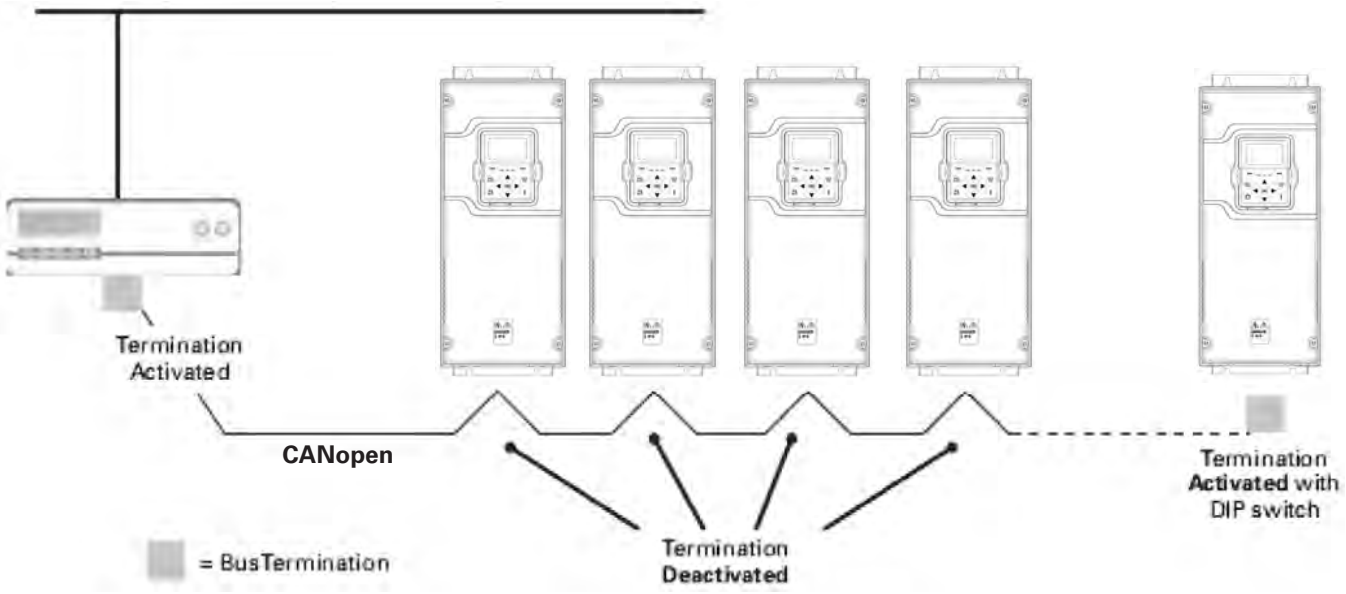
Below are the practical bus length for CANopen networks with less than 64 nodes.

Table 121. Practical bus length

Item	Value						
Baud Rate (kbits/s)	1000	800	500	250	125	50	20
Max. Bus Length in m	30	50	100	250	500	1000	2500

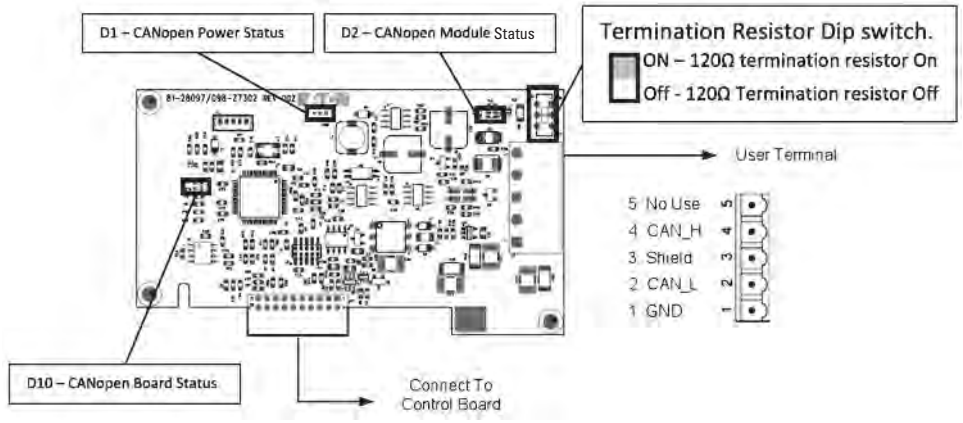
CANopen bus termination

Figure 44. CANopen bus termination



Hardware specification

Figure 45. CANopen hardware



LED status

CANopen LEDs are as stated below.

Table 122. Power LED (D1) Red LED

Illumination Pattern	Meaning
OFF	Power to Option board is not activated
ON	Power to Option board is activated

Table 123. CANopen board status LED (D10) (Red LED)

Illumination Pattern	Meaning
OFF	Option board not activated
ON	Option board in Normal condition, i.e., no fault is occurred
Blinking at 40 Hz	Optional Card Communication Fault
Blinking at 20 Hz	Option card Hardware fault occurs
Blinking at 10 Hz	CAN communication fault occurs

Table 124. CANopen module status—Error LED (D2-Red LED)

Illumination Pattern	Meaning	Description
OFF	No error	The device is in working condition
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
Double flash	Error control event	A guard event (NMT-slave or NMT-master) or a heartbeat event (heartbeat consumer) has occurred
ON	Bus Off	The CAN controller is bus off

Note: An LSS master shall flicker its ERROR and RUN LED whilst executing LSS services.

Table 125. CANopen module status—Run LED (D2-Green LED)

Illumination Pattern	Meaning	Description
Blinking	PREOPERATIONAL	The device is in state PREOPERATIONAL
Single flash	STOPPED	The device is in state STOPPED
On	OPERATIONAL	The device is in state OPERATIONAL

Commissioning

The CANopen board is commissioned by inserting it into Slot A and Slot B ports on the control board. Once the card is inserted to the slot, the device will recognize it and will show a warning for "Device Added." This warning will be shown for 5 seconds and will clear. Once the card is detected, the keypad will show the menu for the card in the Optional Card Menu.

Option card parameters

Once the card is detected, the following parameters can be set on keypad for CANopen.

Figure 46. CANopen parameters

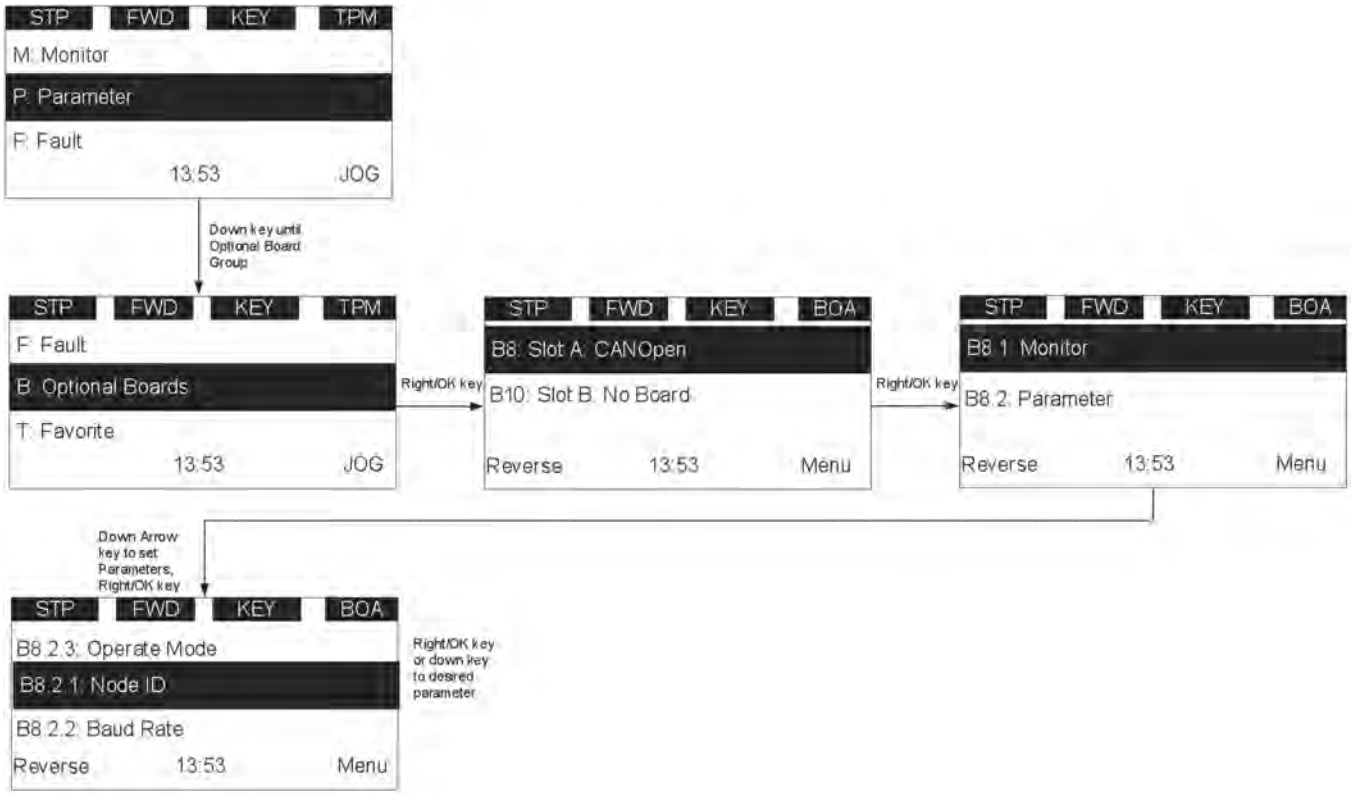


Table 126. CANopen parameters

Code	Parameter	Min.	Max.	Unit	Default	ID (Slot A/Slot B)	Note
BX.1.1	Board Status				0	883/910	B0 = DCOM Comm. Fault B1 = Board HW Fault B2 = Reserved B3 = Fieldbus Fault B4 = Reserved
BX.1.2	Firmware Version					1064/1066	
BX.1.3	Protocol Status				0	2132/2143	0 = Initialization 4 = Stopped 5 = Operational 6 = Pre-Operational
BX.2.1	Node ID	1	127		1	2133/2144	Address of device
BX.2.2	Baud Rate	0	6		0	2134/2145	0 = 1000 kBaud 1 = 800 kBaud 2 = 500 kBaud 3 = 250 kBaud 4 = 125 kBaud 5 = 50 kBaud 6 = 20 kBaud
BX.2.3	Operate Mode	0	1		0	2135/2146	0 = Drive Profile 1 = Bypass Profile
BX.2.4	Comm Card FB Fault Response	0	1		0	2519/2520	0 = In Fieldbus Control 1 = in all Control

Note: PDO1 and PDO2 should be used when in "Drive Mode" and PDO3 and PDO4 used in "Bypass Mode".

By default, the CANopen option board is configured to be used in the Drive Profile mode but can be changed to a Bypass mode, which is a manufacturer specified mode.

Drive profile

The CIA 402 Drive Profile mode where the control of the drive is done using a control word and speed reference value as specified in the drive profile specification.

Bypass profile

In this mode, the drive control can be done using the process data that is defined by the Drive application. The Drive Profile state machine and other objects are not valid in this mode.

Electronic data source file

The usage of devices in a communication network requires configuration of the device parameters and communication facilities. CANopen defines the required standard way to access these parameters via the object directory.

Please refer to the EDS file "PowerXL_CANopen_vx.x.eds."

CANopen overview

CANopen is a network system based on the serial bus network Controller Area Network (CAN). The CANopen communication profile (CiA-301) supports both direct access to device parameters and critical process data communications. CANopen device profiles (CiA DS-40X) define standards for device functionality while providing ample ability for additional vendor-specific device features. CANopen is used in direct peer-to-peer data exchange between nodes and the host machine. CANopen supports cyclic and event driven communications, allowing for reduced bus load and better performance with minimal cable loss.

Device Profile Drives and Motion Control (CiA-402) document represents the standardized CANopen Device Profile for digital controlled motion products like servo, drives or stepper motors. All these types of devices use the same communication techniques that conform to those described in the CANopen Application Layer and Communication Profile. The starting and stopping of the drive and several mode specific commands are executed by the state machine.

CANopen communication objects transmitted via the CAN network are described by services and protocols. They are set up as follows:

- The real-time data transfer is performed by the Process Data Objects (PDOs) protocol
- Service Data Object (SD) protocols provide the read and write access to entries of a device dictionary
- The Network Management (NMT) protocols provide services for network initialization, error control and device status control

CANopen message frame

Table 127. Message Frame

SOF	COB-ID	RTR	CTRL	Data Segment	CRC	ACK	EOF
1 bit	11 bits	1 bit	5 bit	0–8 bytes	16 bits	2 bits	7 bits

SOF	Start of Frame	CRC	Cyclic Redundancy Check
RTR	Remote Transmission Request	ACK	Acknowledge
CTRL	Control Field (i.e., Data Length)	EOF	End of Frame

COB-ID

The identification field of the CANopen-message is 11 bits.

D-Bit	10	9	8	7	6	5	4	3	2	1	0
COB-ID	Function Code				Node ID						

The default identification field consists of a functional part and a module-ID part.
The functional part determines the object priority. This kind of identification field allows communication between a master and 127 slaves. Broadcasting is indicated by a module-ID of zero. Function codes are determined with object dictionaries in device profiles.

Predefined connection set

CANopen pre-defines some communication objects and their connection set (DS301).

Table 128. Predefined connection set

Object	Function Code	COB-ID	Comm. Parameter Index
NMT	0000	0x0000	
Emergency	0010	0x0080+Node ID (Hex)	
TxPDO1	0011	0x0180+Node ID (Hex)	0x1800
RxPDO1	0100	0x0200+Node ID (Hex)	0x1400
TxPDO2	0101	0x0280+Node ID (Hex)	0x1801
RxPDO2	0110	0x0300+Node ID (Hex)	0x1401
TxPDO3	0111	0x0380+Node ID (Hex)	0x1802
RxPDO3	1000	0x0400+Node ID (Hex)	0x1402
TxPDO4	1001	0x0480+Node ID (Hex)	0x1803
RxPDO 4	1010	0x0500+Node ID (Hex)	0x1403
SDO-TX	1011	0x0580+Node ID (Hex)	0x1200-01
SDO-RX	1100	0x0600+Node ID (Hex)	0x1200-02
Node Guarding	1110	0x0700+Node ID (Hex)	0x100E

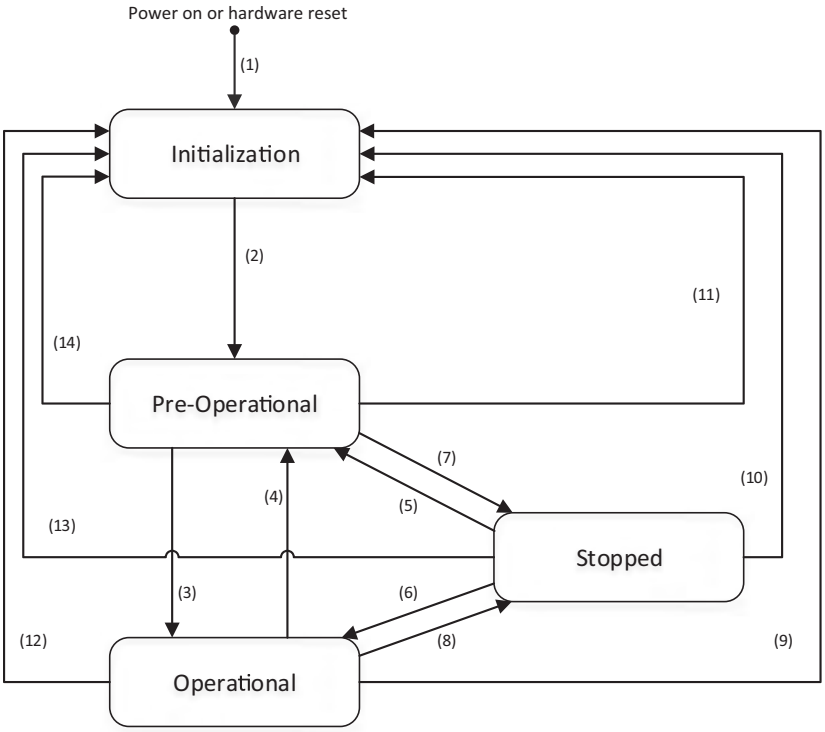
Network management (NMT)

The CANopen network management is node-oriented and follows a master/slave structure. It requires one device to function as the NMT Master, the others are slaves.

The CANopen NMT slave devices implement state machine tasks shown below. After power-up of a node, it will initialize and transmit to the "Pre-Operational State." In this state, communication across SDO channels is possible for node configuration, but not yet across PDOs. With the NMT message "Start Remote Node," a selected node or all nodes on the network can be set into the "Operational State." When the device is in this state, data exchange can be done via PDOs.

NMT network management manages CANopen, and is a mandatory, common feature for all devices. The protocol describes several node control services and the state machine.

Figure 47. NMT state machine



1 = When the power is on, the NMT state is entered autonomously.

2 = The NMT state initialization is finished, the NMT pre-operational state is entered automatically.

3 = NMT service starts with remote node indication or by local control.

4 and 5 = NMT service enters pre-operational indication.

6 = NMT service starts remote node indication.

7 and 8 = NMT service stops remote node indication.

9, 10 and 11 = NMT resets node indication.

12, 13 and 14 = Indication of NMT service reset communication.

To set the connected node into the "Operational State," the following message is required.

Table 129. Start remote node message

CAN ID	LENGTH	DATA 0	DATA 1	DATA 2	DATA 3	DATA 4	DATA 5	DATA 6	DATA 7
0x0	0x2	0x1	NODE ID						

The stop remote message sets the node into a "Stopped State" indicated in the NMT state machine. When the node ID in the message is set to "0," the message broadcasts to all nodes on the network.

Table 130. Stop remote node message

CAN ID	LENGTH	DATA 0	DATA 1	DATA 2	DATA 3	DATA 4	DATA 5	DATA 6	DATA 7
0x0	0x2	0x2	NODE ID						

The pre-operation message sets the node into the "Pre-Operational state" indicated in the NMT state machine. If the node ID in the message is set to "0," it will broadcast to all nodes.

Table 131. Enter pre-operational message

CAN ID	LENGTH	DATA 0	DATA 1	DATA 2	DATA 3	DATA 4	DATA 5	DATA 6	DATA 7
0x0	0x2	0x80	NODE ID						

The reset node message makes the nodes apply application reset. The application reset sets the whole object dictionary back to the default or previously stored values. If the node ID in the message is set to "0," it will broadcast to all nodes. Upon a reset, the node will enter into the "Pre-Operational state."

Table 132. Reset node message

CAN ID	LENGTH	DATA 0	DATA 1	DATA 2	DATA 3	DATA 4	DATA 5	DATA 6	DATA 7
0x0	0x2	0x81	NODE ID						

The reset communication message when sent to the node causes the communication reset. This does not affect the object dictionary values. If the node ID in the message is set to "0," it will broadcast to all nodes. After the node has received the communication reset, it will enter into the "Pre-Operational" state.

Table 133. Reset communication message

CAN ID	LENGTH	DATA 0	DATA 1	DATA 2	DATA 3	DATA 4	DATA 5	DATA 6	DATA 7
0x0	0x2	0x82	NODE ID						

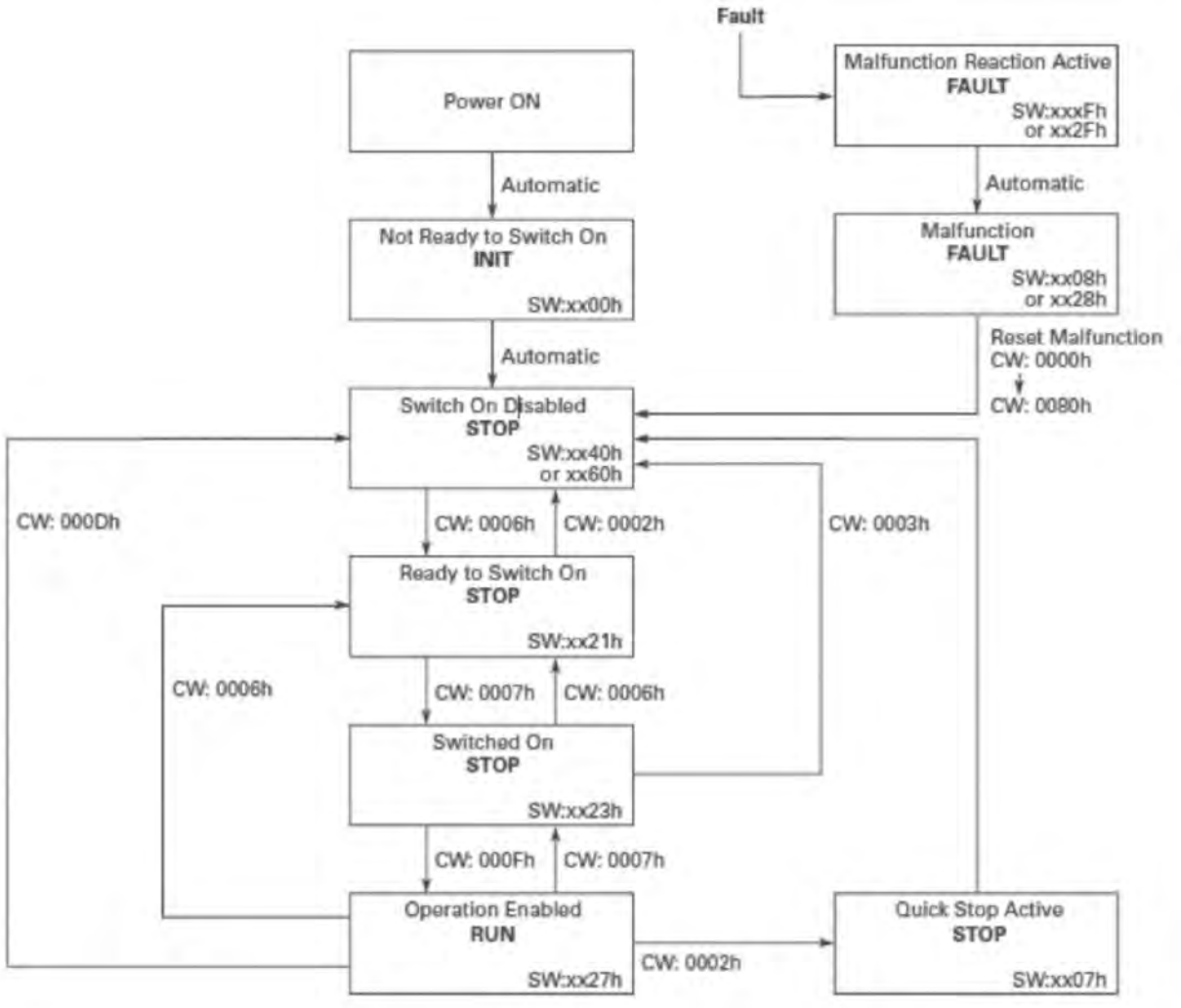
Drive profile state machine

State machine

The state machine describes the device status and the possible control sequence of the drive. The state transitions can be generated by using "controlword." The "statusword" parameter indicates the current status of the state machine. The modes ***INIT, STOP, RUN*** and ***FAULT*** correspond to the actual mode of the drive.

SW = StatusWord
CW = ControlWord

Figure 48. Internal state machine



Device profile parameters

Table 134. Device profile parameters index

Hex	Dec	Sub-Index	Name	Type	Attr.
6040	24640		control word	Unsigned16	RW
6041	24641		status word	Unsigned16	RO
6042	24642		vl target velocity	Integer16	RW
6043	24643		vl velocity demand	Integer16	RO
6044	24644		vl control effort	Integer16	RO
6046	24646		vl velocity min max amount		
		0	Number of entries	Unsigned8	RO
		1	Minimum speed	Unsigned16	RW
		2	Maximum speed	Unsigned16	RW
6048	24648		vl velocity acceleration		
		0	Number of entries	Unsigned8	RO
		1	delta speed	Unsigned32	RW
		2	delta time	Integer16	RW
6049	24649		vl velocity deceleration		
		0	Number of entries	Unsigned8	RO
		1	delta speed	Unsigned32	RW
		2	delta time	Integer16	RW
604A	24650		vl velocity quick stop		
		0	Number of entries	Unsigned8	RO
		1	delta speed	Unsigned32	RW
		2	delta time	Integer16	RW
604E	24654		vl velocity reference	Unsigned32	RW
6052	24658		vl nominal percentage	Integer16	RW
6053	24659		vl percentage demand	Integer16	RO
6054	24660		vl actual percentage	Integer16	RO
6060	24672		modes of operation	Unsigned8	RW
6061	24673		modes of operation display	Unsigned8	RO

Control word

The control word is used to control the drive operation according to the Internal State Machine. This is mapped into the first 2 bytes of rxPDO1.

Table 135. 0x6040 control word

Bit	Name	Description
0	Switch ON	Enables drive start command
1	Disable Voltage	Enable/Disable DG1 Motor output voltage
2	Quick Stop	Stops drive with a 0.1 sec ramp when value is changed to 0.
3	Enable Operation	Enable drive start
4	Operation Mode Specific	Not Used
5	Operation Mode Specific	Not Used
6	Operation Mode Specific	Not Used
7	Reset Fault	Rising Edge resets active faults.
8	Reserved	Not Used
9	Reserved	Not Used
10	Reserved	Not Used
11	Manufacturer Specific	Not Used
12	Manufacturer Specific	Not Used
13	Manufacturer Specific	Not Used
14	Manufacturer Specific	Not Used
15	Manufacturer Specific	Not Used

Status word

The Status Word provides drive status for the current control. By default this is mapped into the first 2 bytes of txPDO1

Table 136. 0x6041 status word

Bit	Name	Description
0	Ready to Switch ON	Device is in the ready state, ready to switch on
1	Switched ON	Device switch is enabled
2	Operation Enabled	Device drive is enabled and running
3	Fault Present	Device Fault is present
4	voltage disable	Drive output voltage is enabled
5	Quick Stop	Device Quick Stop is enabled
6	Switching On Disable	Device switch is disabled
7	Warning Present	Indicates if drive is in Warning state
8	Manufacturer Specific	Not Used
9	Remote	Indicates if the drive is in the Remote control state
10	Target Reached Or Exceeded	Target velocity is reached
11	Manufacturer Specific	Not Used
12	Manufacturer Specific	Not Used
13	Manufacturer Specific	Not Used
14	Manufacturer Specific	Not Used
15	Manufacturer Specific	Not Used

VL Target velocity

The signed value of the requested motor rpm speed. When the value is reading negative, it indicates the motor spinning in the counterclockwise direction. By default, this is mapped into the bytes of RxPDO1.

Range: –32768 to 32767

VL Velocity demand

The signed value is of the ramp generator output scaled into rpm and is a read only value. A negative value will indicate the motor is running in the clockwise direction.

Range: –32768 to 32767

VL Velocity control effort

This signed value is the motor actual rpm speed. A negative value will indicate that the motor is running in the clockwise rotation. By default, this is mapped into the TxPDO1.

Range: –32678 to 32767

Process data (PDO)

The real time data transfer is performed by means of using the "Process Data Objects." The transfer of PDOs is performed with no protocol overhead. The Process Data is time-critical data used for control of the drive and monitor status.

Table 137. Process data (PDO)

RxPDO1										
Header			**Data**							
ID	**RTR**	**LEN**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
0x201	0	4	Control Word		Target Velocity					
TxPDO1										
Header			**Data**							
ID	**RTR**	**LEN**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
0x181	0	4	Status Word		Control effort					
RxPDO2										
Header			**Data**							
ID	**RTR**	**LEN**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
0x301	0	8	Motor Nominal Percentage		Velocity deceleration delta speed				Velocity deceleration delta time	
TxPDO2										
Header			**Data**							
ID	**RTR**	**LEN**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
0x281	0	8	Motor Actual Percentage		Torque %		Current %		Fault Code	
RxPDO3										
Header			**Data**							
ID	**RTR**	**LEN**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
0x401	0	8	Fixed control word		Speed reference Percentage		FB_Process_data_in1		FB_Process_data_in2	
TxPDO3										
Header			**Data**							
ID	**RTR**	**LEN**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
0x381	0	8	Fixed status word		Actual speed Percentage		FB_Process_data_out1		FB_Process_data_out2	
RxPDO4										
Header			**Data**							
ID	**RTR**	**LEN**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
0x501	0	8	FB_Process_data_in3		FB_Process_data_in4		FB_Process_data_in5		FB_Process_data_in6	
TxPDO4										
Header			**Data**							
ID	**RTR**	**LEN**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
0x481	0	8	FB_Process_data_out3		FB_Process_data_out4		FB_Process_data_out5		FB_Process_data_out6	

Some drive actual values can be monitored by using a Process Data Object 2 (rx).
Addressing of the data in these addresses is based off the following scheme this is in a hex:

RxPDO1 = 0x200 + node ID(hex) RxPDO2 = 0x300 + node ID(hex) RxPDO3 = 0x400 + node ID(hex) RxPDO4 = 0x500 + node ID(hex)

TxPDO1 = 0x180 + node ID(hex) TxPDO2 = 0x280 + node ID(hex) TxPDO3 = 0x380 + node ID(hex) TxPDO4 = 0x480 + node ID(hex)

Note: PDO1 and PDO2 should be used when in "Drive Mode" and PDO3 and PDO4 used in "Bypass Mode."

vl_actual percentage Motor Speed. Scaled with percentage function
_torque_percentage Calculated torque. Scaled in 0.0%–100% (0–1000)
_current_percentage Measured motor current. (1 = 0.01 A)
fault_code Shows the drive fault code (= 0, if no fault active)

Fixed control word

Table 138. Fixed control word

Bit	Name
0	Run
1	Counterclockwise
2	Rising edge of this bit will reset active fault
3	FB Input data 1
4	FB Input data 2
5	FB Input data 3
6	FB Input data 4
7	Bypass
8	FB_Ctrl
9	FB_Ref
10	Not in use
11	Not in use
12	Not in use
13	Not in use
14	Not in use
15	Not in use

Bit	Description Value = 0	Value = 1
0	Stop	RUN
1	Clockwise	Counterclockwise
2	Rising edge of this bit will reset active fault	Rising edge of this bit will reset active fault
3	FB Input data 1 off	FB Input data 1 On
4	FB Input data 2 off	FB Input data 2 On
5	FB Input data 3 off	FB Input data 3 On
6	FB Input data 4 off	FB Input data 4 On
7	Switch to drive	Switch to bypass
8	Control of drive is not selected from fieldbus	Control of drive is selected from fieldbus
9	Reference is not selected from fieldbus	Reference is selected from fieldbus
10–15	Not in use	Not in use

Speed ref percentage

The Speed Reference Percentage is based off a 0 to 100.00 %(10000) scale with 0 being 0 rpm and 10000 indicating 100.00% speed value. A negative value will indicate the inverted direction.

Process data in

The Process Data In values are based off the application selected. See **Appendix B** to reference the current Process Data In values assigned.

Fixed status word

Table 139. Fixed status word

Bit	Name
0	Ready
1	RUN
2	Counterclockwise
3	Faulted
4	Warning
5	Ref. Frequency reached
6	Bypass
7	Run enable
8	Not in use
9	Not in use
10	Not in use
11	Not in use
12	Not in use
13	Not in use
14	Not in use
15	Not in use

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	—	Motor is running in bypass
7	Disable motor run	Enable motor run
8–15	Not in use	Not in use

Actual speed percentage

The Actual Speed Percentage indicates the actual speed value of the motor. This value will be read as a 0 to 10000 value, which indicates 0 to 100.00% speed actual.

FB process data out

The Process Data Out value is assigned by the Fieldbus Parameter group in the application parameters. These 8 values can be set to any available Modbus ID value listed. See **Appendix B** to reference the default Process Data Out values assigned.

Object directory

Table 140. Object directory index

Hex	Dec	Sub-Index	Name	Type	Attr.
1000	4096		Device type	Unsigned32	RO
1001	4097		Error register	Unsigned8	RO
1003	4099		Predefined error field		
		0	Highest index	Unsigned8	RW
		1	Standard error field 1	Unsigned32	RO
100C	4108		Guard time	Unsigned16	RW
100D	4109		Life time factor	Unsigned8	RW
1014	4116		COB ID EMCY	Unsigned 32	RO
1018	4120		Identity object		
		0	Highest index	Unsigned8	RW
		1	Vendor ID	Unsigned32	RO
		2	Product Code	Unsigned32	RO
		3	Revision number	Unsigned32	RO
		4	Serial number	Unsigned32	RO
1200	4608		Server SDO parameter		
		0	Highest index	Unsigned8	RW
		1	COB-ID Client⟶Server (RX)	Unsigned32	RO
		2	COB-ID Server⟶ Client (TX)	Unsigned32	RO
1400	5120		Receive PDO communication parameter 1		RO
		0	Number of entries	Unsigned8	RW
		1	COB ID	Unsigned32	RW
		2	Transmission type	Unsigned8	RO
1401	5121		Receive PDO communication parameter 2		
		0	Number of entries	Unsigned8	RW
		1	COB ID	Unsigned32	RW
		2	Transmission type	Unsigned8	RO
1402	5122		Receive PDO communication parameter 3		RO
		0	Number of entries	Unsigned8	RW
		1	COB ID	Unsigned32	RW
		2	Transmission type	Unsigned8	RO
1403	5123		Receive PDO communication parameter 4		
		0	Number of entries	Unsigned8	RW
		1	COB ID	Unsigned32	RW
		2	Transmission type	Unsigned8	RO
1600	5632		Receive PDO 1 mappings		
		0	Number of mapped objects	Unsigned8	RW
		1	60400020-controlword	Unsigned32	RO
		2	60420010-vl target velocity	Integer16	RO
1601	5633		Receive PDO 2 mappings		
		0	Number of mapped objects	Unsigned8	RW
		1	60520010-vl nominal percentage	Integer16	RO
		2	60490120-vl velocity deceleration-delta speed	Unsigned32	RO
		3	60490210-vl velocity deceleration-delta time	Integer16	RO

Table 140. Object directory index, continued

Hex	Dec	Sub-Index	Name	Type	Attr.
1602	5634		Receive PDO 3 Mappings		
		0	Number of mapped objects	Unsigned8	RW
		1	20100010-Fixed control word	Unsigned16	RW
		2	20110010-Speed reference in percentage	Unsigned16	RW
		3	20120010-FB process data In 1	Integer16	RW
		4	20130010-FB process data In 2	Integer16	RW
1603	5635		Receive PDO 4 mappings		
		0	Number of mapped objects	Unsigned8	RW
		1	20140010-FB process data In 3	Integer16	RW
		2	20150010-FB process data In 4	Integer16	RW
		3	20160010-FB process data In 5	Integer16	RW
		4	20170010-FB process data In 6	Integer16	RW
1800	6144		Transmit PDO 1 communication parameters		
		0	Highest sub index	Unsigned8	RO
		1	COB ID	Unsigned32	RW
		2	Transmission type	Unsigned8	RO
		3	Inhibit time	Unsigned16	RW
		4	Event timer	Unsigned16	RW
1801	6145		Transmit PDO 2 communication parameters		
		0	Highest Sub index	Unsigned8	RO
		1	COB ID	Unsigned32	RW
		2	Transmission type	Unsigned8	RO
		3	Inhibit Time	Unsigned16	RW
		4	Event timer	Unsigned16	RW
1802	6146		Transmit PDO 3 communication parameters		
		0	Highest Sub index	Unsigned8	RO
		1	COB ID	Unsigned32	RW
		2	Transmission type	Unsigned8	RO
		3	Inhibit time	Unsigned16	RW
		4	Event timer	Unsigned16	RW
1803	6147		Transmit PDO 4 communication parameters		
		0	Highest sub index	Unsigned8	RO
		1	COB ID	Unsigned32	RW
		2	Transmission type	Unsigned8	RO
		3	Inhibit Time	Unsigned16	RW
		4	Event timer	Unsigned16	RW
1A00	6656		Transmit PDO 1 mappings		
		0	Number of mapped objects	Unsigned8	RW
		1	60410010-statusword	Unsigned16	RO
		2	60440010-vl control effort	Unsigned16	RO

Table 140. Object directory index, continued

Hex	Dec	Sub-Index	Name	Type	Attr.
1A01	6657		Transmit PDO 2 mappings		
		0	Number of mapped objects	Unsigned8	RW
		1	60540020-vl velocity reference	Unsigned32	RO
		2	20040010- torque percentage	Unsigned16	RO
		3	20030010- Current percentage	Unsigned16	RO
		4	20630010-fault code	Unsigned16	RO
1A02	6658		Transmit PDO 3 mappings		
		0	Number of mapped objects	Unsigned8	RW
		1	20180010-Fixed status word	Unsigned16	RO
		2	20190010-Actual speed in percentage	Unsigned16	RO
		3	20200010-FB process data Out 1	Integer16	RO
		4	20210010-FB process data Out 2	Integer16	RO
1A03	6659		Transmit PDO 4 Mappings		
		0	Number of mapped objects	Unsigned8	RW
		1	20220010-FB process data Out 3	Integer16	RO
		2	20230010-FB process data Out 4	Integer16	RO
		3	20240010-FB process data Out 5	Integer16	RO
		4	20250010-FB process data Out 6	Integer16	RO

Service data (SDO)

With Service Data Objects (SDOs), the access to entries of a device Object Dictionary is provided. Via SDO, all items from object dictionary can be read/write. These are mainly used for device configuration such as setting device parameters. They are also used to define the types and formats of the information in the Process Data Objects. CANopen Configuration tools with EDS files can be used for this purpose.

SDO protocol can be used to read any parameter or actual value and write any parameter from the drive. These parameters are read from the drive with its ID number specified in the user manual. There are three indexes in the object dictionary as follows for Any Parameter service.

Table 141. Service data (SDO)

Index	Description	Size	Access Type	Hi 16 b	Low 16 b
2000	AnyparameterReadID	UINT16	RW	-	Read ID
2001	AnyparameterReadValue	UINT32	RO	Status	Value
2002	AnyparameterWrite	UINT32	RW	ID	Write Value

Reading any parameter

Writing new value to index 2000 will trigger read event, while read in process index 2001 is zero. Read event will return value to index 2001. If read is success, status will get value of ID and Value is value of ID. If read fails, the Status will get value 0xFFFF (Dec 65535).

Writing any parameter

When new ID and value is written to index 2002, a write event will be triggered. Index 2002 value will remain as long as writing is processed (normal SDO/PDO operation during this time). If write is success, index 2002 ID and value will be cleared and new write is possible. If write fails, ID will clamp to 0xFFFF and value zero.

Process data application mapping

Table 142. Process data application mapping index

Hex	Dec	Sub-Index	Name	Type	Attr.
2000	8192		Any parameter read ID	Unsigned16	RW
2001	8193		Any parameter read value	Unsigned32	RO
2002	8194		Any parameter write	Unsigned32	RW
2003	8196		Current percentage	Unsigned16	RO
2004	8195		Torque percentage	Unsigned16	RO
2005	8197		Motor nom current	Unsigned16	RW
2006	8198		Motor nom speed	Unsigned16	RW
2007	8199		Motor PF	Unsigned16	RW
2008	8200		Motor nom voltage	Unsigned16	RW
2009	8201		Motor nom frequency	Unsigned16	RW
200A	8202		Power up local remote select	Unsigned8	RW
200B	8203		Remote 1 control place	Unsigned8	RW
200C	8204		Local control place	Unsigned8	RW
200D	8205		Local reference	Unsigned8	RW
200E	8206		Remote 1 ref	Unsigned8	RW
200F	8207		Reverse enable	Unsigned8	RW
2010	8208		Fixed control word	Unsigned16	RW
2011	8209		Speed reference in percentage	Unsigned16	RW
2012	8210		FB process data in 1	Integer16	RW
2013	8211		FB process data in 2	Integer16	RW
2014	8212		FB process data in 3	Integer16	RW
2015	8213		FB process data in 4	Integer16	RW
2016	8214		FB process data in 5	Integer16	RW
2017	8215		FB process data in 6	Integer16	RW
2018	8216		Fixed status word	Unsigned16	RO
2019	8217		Actual speed in percentage	Unsigned16	RO
201A	8218		FB process data out 1	Integer16	RO
201B	8219		FB process data out 2	Integer16	RO
201C	8220		FB process data out 3	Integer16	RO
201D	8221		FB process data out 4	Integer16	RO
201E	8222		FB process data out 5	Integer16	RO
201F	8223		FB process data out 6	Integer16	RO
2063	8291		Fault code	Integer16	RO

Fixed control word

Refer to **Table 138** on **page 113**.

Speed ref percentage

The Speed Reference Percentage is based off a 0 to 100.00 % (10000) scale with 0 being 0 rpm and 10000 indicating 100.00% speed value.

Process data in

The Process Data In values are based off the application selected. See **Appendix B** to reference the current Process Data In values assigned.

Fixed status word

Refer to **Table 139** on **page 114**.

Actual speed percentage

The Actual Speed Percentage indicates the actual speed value of the motor. This value will be read as a 0 to 10000 value, which indicates 0 to 100.00% speed actual.

FB process data out

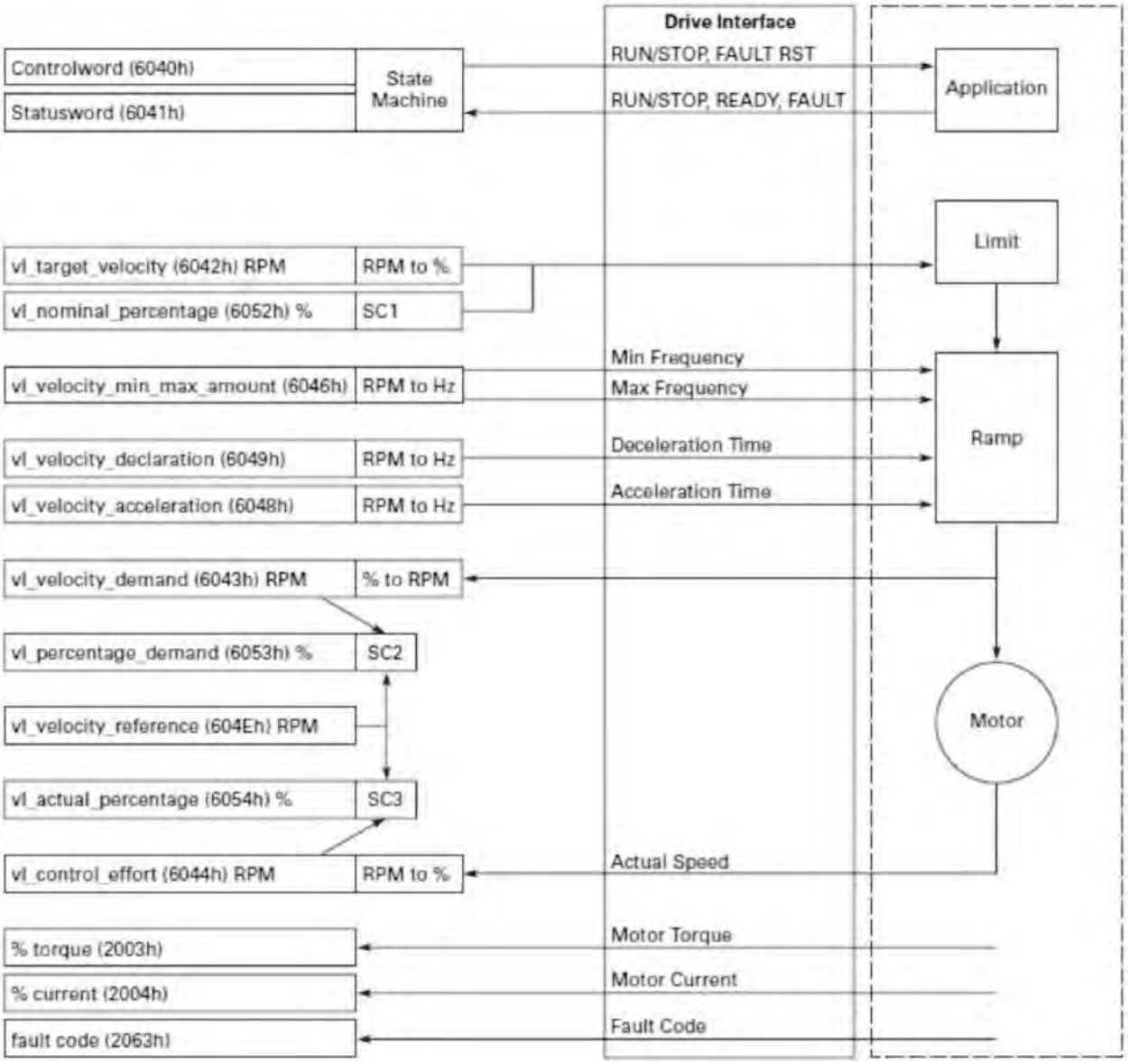
The Process Data Out value is assigned by the Fieldbus Parameter group in the application parameters. These 8 values can be set to any available Modbus ID value listed. See **Appendix B** to reference the default Process Data Out values assigned.

Fault code

The Fault Code is an indication of the current fault code; the default value will be 0.

Bypass profile

Figure 49. Device profile



SC2: Percentage Function 2

$$vl\_percentage\_demand = \frac{vl\_velocity\_demand * 0x3FFF}{vl\_velocity\_reference}$$

SC3: Percentage Function 3

$$vl\_actual\_percent = \frac{vl\_control\_effort * 0x3FFF}{vl\_velocity\_reference}$$

DeviceNet External Communication Cards

DeviceNet is an open protocol network based on the CAN stack protocol. It is designed to connect industrial control devices to a network without expensive hardwiring. With direct connectivity, DeviceNet provides improved communications between devices as well as important device diagnostic information that is typically not as easily accessed with hardwired I/O interfaces.

The DeviceNet model is referred to as an application independent. It provides communication services needed by various types of applications. It uses a predefined Master/ Slave connection set that is used between the devices on the network with the master controller. This being said it is based on the CIP (Common Industrial Protocol).

DeviceNet technical data

Table 143. DeviceNet connection

Item	Value
Interface	Open style connector (Pluggable connector)
Data Transfer method	CAN
Transfer Cable	2 wire Twisted shielded cable with 2 wire but power cable and drain
Electrical Isolation	500 Vdc

Table 144. Communications

Item	Value
ODVA CT26 Compliant	
Baud rate	500 kBaud 250 kBaud 125 kBaud
Addresses	0-63
Product Code	0x3019
Product Type	0x02
Vendor ID	68
DeviceNet	Network supply voltage: 11 to 25 Vdc network input current: 28 mA typical, 125 mA inrush (24 Vdc)

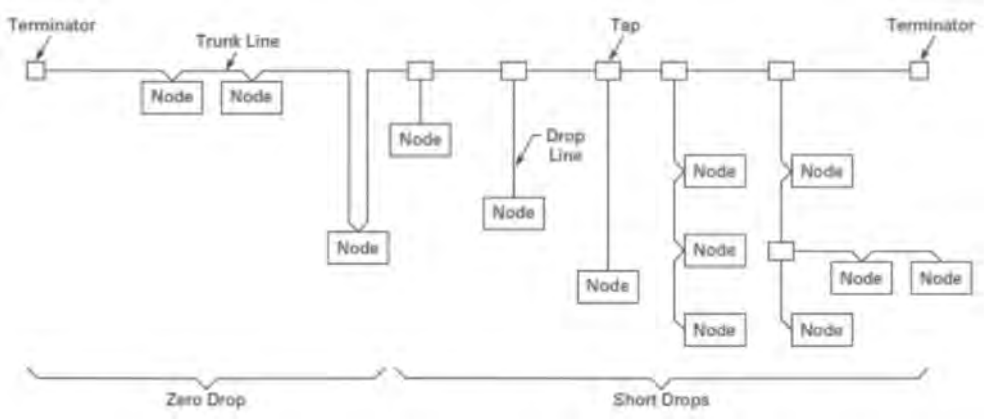
Table 145. Environment

Description	Specification	
Ambient Operation Temperature	–10 °C to +55 °C	
Storing Temperature	–40 °C to +60 °C	
Humidity	<95%, no condensation allowed	
Altitude	Max. 1000 M	
Vibration	0.5G at 9–200 Hz	
Safety	Fulfills EN 50178 standard	
Baud Rate	125 Kbps, 250 Kbps and 500 Kbps	
Network Size	Up to 64 nodes including master	
Network Length	Selectable end to end distance varies with speed	
	Baud rate	Distance
	125 Kbps	500 m
	250 Kbps	250 m
	500 Kbps	100 m

DeviceNet cabling

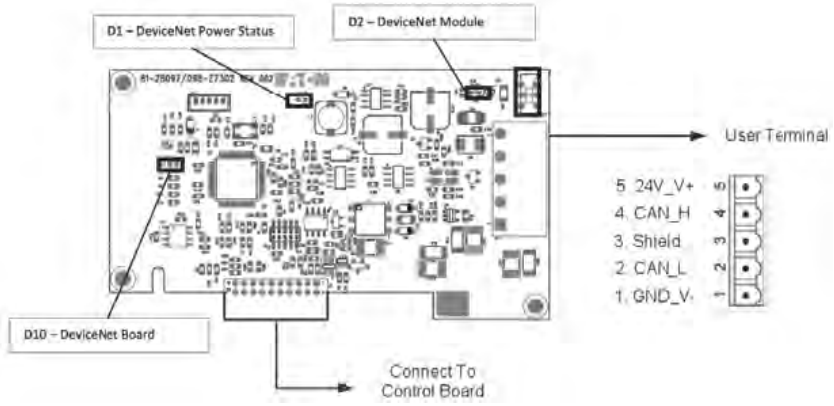
When using DeviceNet, it uses a basic trunk-line/drop-line topology with separate twisted pair busses for both signal and power distribution. Wire diameter for the trunk and drop lines may vary, and the distance will be determined by baud rate and cable size. In this topology, devices are powered directly from the bus and communicate with each other using the same cable. Nodes can also be removed or inserted into the network without powering it down.

Figure 50. Trunk lines or drop lines



Hardware specification

Figure 51. DeviceNet hardware



DeviceNet External Communication Cards has termination switch S1. It should not be used in network and kept at OFF position.

DeviceNet board LED status

Table 146. DeviceNet power LED (D1)

Illumination Pattern	Meaning
OFF	Power to controller of Option board is not activated
ON	Power to controller of Option board is activated

Table 147. DeviceNet Board status LED (D10)

Illumination Pattern	Meaning
OFF	Option board not activated
ON	Option board in Normal condition i.e. no fault is occurred
Blinking at 40 Hz	DCOM communication fault occurs
Blinking at 20 Hz	Option card Hardware fault occurs
Blinking at 10 Hz	DeviceNet communication fault occurs

Table 148. The MS and NS LED (D2)

For this state ...	LED is ...	To indicate ...
Device not powered/ not on–line	Off	Device is not on–line. • The device has not completed the Dup_MAC_ID test yet. • The device may not be powered.
Device operational AND On–line, connected	Green	The device is operating in a normal condition and the device is on–line with connections in the established state. • For a Group 2 Only device it means that the device is allocated to a Master. • For a UCMM capable device it means that the device has one or more established connections.
Device operational AND On–line, not connected or Device On–line AND Device needs commissioning	Flashing Green	The device is operating in a normal condition and the device is on–line with no connections in the established state. • The device has passed the Dup_MAC_ID test, is on–line, but has no established connections to other nodes. • For a Group 2 Only device it means that this device is not allocated to a master. • For a UCMM capable device it means that the device has no established connections. • Configuration missing, incomplete or incorrect.
Minor Fault and/or Connection Time–Out and/or No Network Power	Flashing Red	Any one or more of the following conditions: • Recoverable fault • One or more I/O Connections are in the Timed-Out state • No network power present
Critical Fault or Critical Link Failure	Red	The device has an unrecoverable fault; may need replacing. Failed communication device. The device has detected an error that has rendered it incapable of communicating on the network (Duplicate MAC ID, or Bus–off).
Communication Faulted and Received an Identify Comm Fault Request—Long Protocol	Flashing Red and Green	A specific Communication Faulted device. The device has detected a Network Access error and is in the Communication Faulted state. The device has subsequently received and accepted an Identify Communication Faulted Request—Long Protocol message.

Figure 52. Module and network status

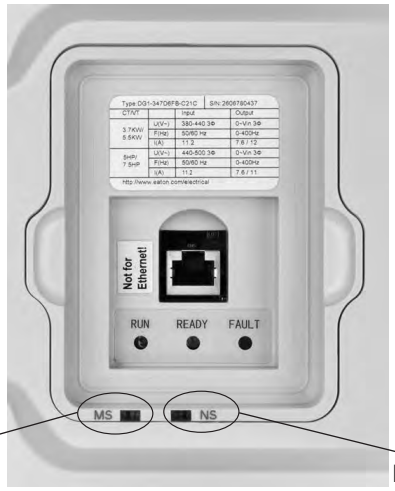


Table 149. Module status LED description

Indicator state	Summary	Meaning
Steady off	No power	No power is supplied to the drive
Steady green	Device operational	Drive is operating in a normal condition.
Flashing green*	Standby	Drive has not been commissioned. The device needs commissioning due to configuration missing, incomplete or incorrect
Flashing red*	Recoverable fault	Drive has detected a recoverable fault
Steady red	Unrecoverable fault	Drive has an unrecoverable fault; may need replacing.
Flashing green/red**	Self-test	Drive is performing its power on self-test

Table 150. Network status LED description

Indicator state	Summary	Meaning
Steady off	Not powered	PowerXL DG1 is not on–line. - PowerXL DG1 has not completed the Dup_MAC_ID test yet. - PowerXL DG1 may not be powered, look at Module Status LED. - No network power present.
Steady green	Device Operational AND	PowerXL DG1 is operating in a normal condition and is on–line with connections in the established state
Flashing green*	Device Operational AND On–line, Not Connected or Device On–line AND Device needs commissioning	PowerXL DG1 is operating in a normal condition and is on–line but has no connections in the established state. PowerXL DG1 has passed the Dup_MAC_ID test, is on–line, but has no established connections to other nodes.
Flashing red*	Minor Fault and/or Connection Time–Out and/or No Network Power	Any one or more of the following conditions: - Recoverable fault - One or more I/O Connections are in the Timed-Out state - No network power present
Steady red	Critical Link Failure	Failed communication device. PowerXL DG1 has detected an error that has rendered it incapable of communicating on the network (Duplicate MAC ID, or Bus–off).

Commissioning

The DeviceNet board is commissioned by inserting it into Slot A and Slot B ports on the control board. Once the card is inserted into the slot, the device will recognize it and will show a warning for "Device Added." This warning will be shown for 5 seconds and will clear. Once the card is detected, the keypad will show the menu for the card in the Optional Card Menu.

Option card parameters

Once the card is detected, the following parameters can be set on keypad for DeviceNet

Figure 53. DeviceNet parameters

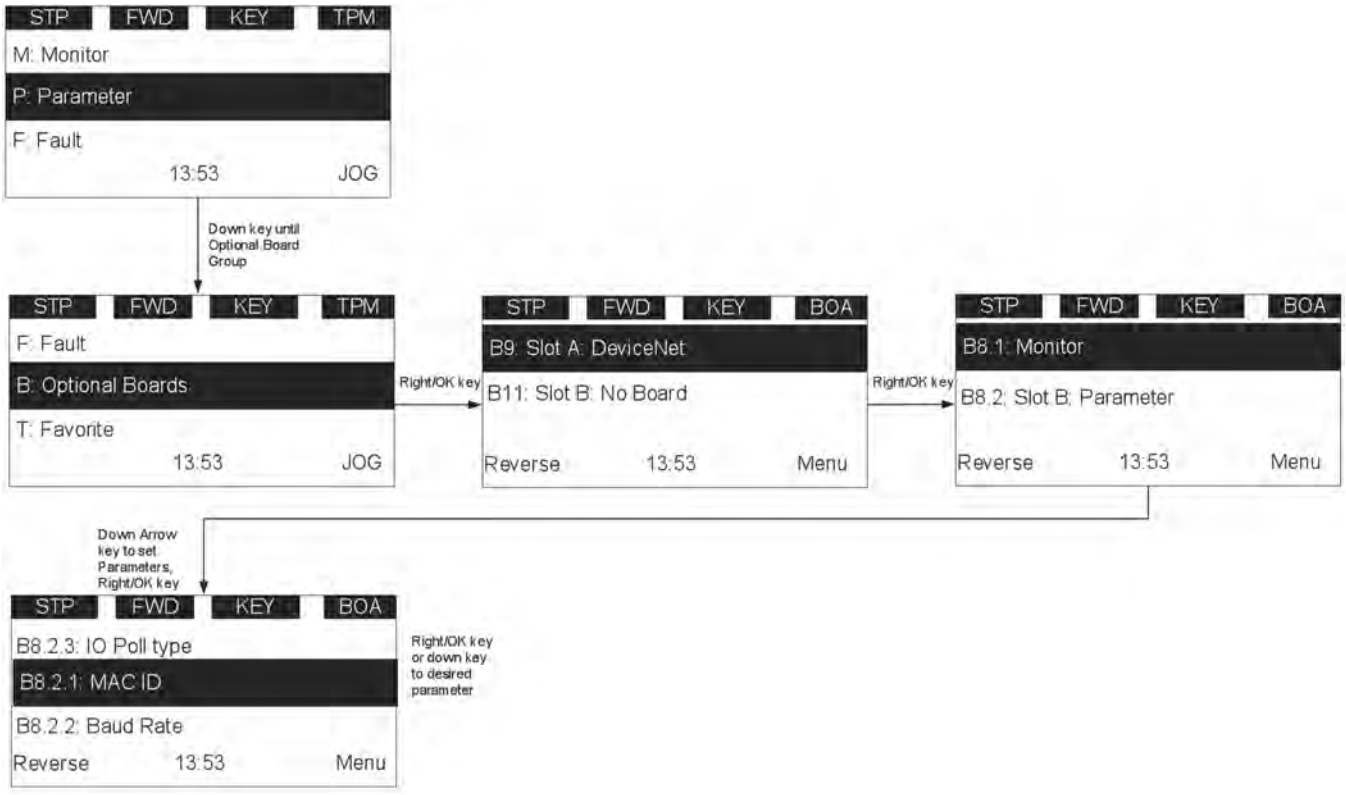


Table 151. DeviceNet parameters

Code	Parameter	Min.	Max.	Unit	Default	ID (Slot A/Slot B)	Note
BX.1.1	Board status				0	883/910	B0 = DCOM Comm. Fault B1 = Board HW fault B2 = Reserved B3 = Fieldbus fault B4 = DNET 24 V fault
BX.1.2	Protocol status				0	2136/2147	0 = Non existent bus power 1 = Configuring state 2 = Established 3 = Timeout
BX.2.1	MAC ID	0	63		63	2137/2148	Address of device.
BX.2.2	Baud rate	0	2		0	2138/2149	0 = 125 kBaud 1 = 250 kbaud 2 = 500 kBaud
BX.2.3	IO Poll type	0	7		0	2187/2188	0 = Assembly 21/71 1 = Assembly 20/70 2 = Assembly 21/71 3 = Assembly 23/73 4 = Assembly 25/75 5 = Assembly 101/107 6 = Assembly 111/117 7 = Assembly 111/127
BX.2.4	Comm Card FB Fault Response	0	1		0	2519/2520	0 = In Fieldbus Control 1 = in all Control

DeviceNet Overview

DeviceNet is designed to provide two different types of messaging: I/O Messaging and Explicit Messaging.

I/O Messaging

I/O polling messages are set up for time-critical data that is oriented for control sequences. These messages are transferred between the devices and the master at all times and used for continuous control of the devices. It is a dedicated communication path between the producing application or master device and the one or more consuming devices or slaves. These messages are not in the 8-byte data protocol. Before messages are sent, the master and slave need to be configured. In the configuration, it contains the source and destination object attribute addresses for the master and slave.

Assembly instances implemented by PowerXL DG1 DeviceNet

Assemblies 20, 21, 23, 25 ODVA AC/DC profile; assemblies 70, 71, 73 & 75 ODVA AC/DC profile; assemblies >100, Eaton profile.

Output instances

Assembly instance 20

Table 152. Instance 20 (Output) length = 4 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0						FaultReset		RunFwd
1								
2	Speed reference (Low Byte), rpm							
3	Speed reference (High Byte), rpm							

Assembly instance 21

Table 153. Instance 21 (Output) length = 4 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		NetRef	NetCtrl			FaultReset	RunRev	RunFwd
1								
2	Speed reference (Low Byte), rpm							
3	Speed reference (High Byte), rpm							

Assembly instance 23

Table 154. Instance 23 (Output) length = 6 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		NetRef	NetCtrl			FaultReset	RunRev	RunFwd
1								
2	Speed reference (Low Byte), rpm							
3	Speed reference (High Byte), rpm							
4	Torque reference (Low Byte), Nm ①							
5	Torque reference (High Byte), Nm ①							

① Torque Reference is sent to the Drive only if Motor Control Mode is set to "Torque Control".

Note: Torque Reference is send to the Drive as a Process Data 1.

Assembly instance 25

Table 155. Instance 25 (Output) length = 6 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		NetRef	NetCtrl			FaultReset	RunRev	RunFwd
1								
2	Speed reference (Low Byte), rpm							
3	Speed reference (High Byte), rpm							
4	Process reference (Low Byte) ①							
5	Process reference (High Byte)							

① In Speed control Mode—Process Ref is Process Data IN8 (Analog Output).
In Freq. control—Process Ref is Process Data IN8 (Analog Output, reading the actual output current.).
In Torque control—Process Ref is Process Data IN1 (Torque Reference)
Based on selection of AO, process reference value will be sent on AO out

Assembly instance 101

Table 156. Instance 101 (Output) length = 8 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		NetRef	NetCtrl	FB DATAIN 2	FB DATAIN 1	FaultReset	RunRev	RunFwd
1	PDSELB3	PDSELB2	PDSELB1	PDSELB0	PDSELA3	PDSELA2	PDSELA1	PDSELA0
2	FBSpeed Reference (Low Byte), rpm							
3	FBSpeed Reference (High Byte), rpm							
4	FBProcessDataIn1 (Low Byte)							
5	FBProcessDataIn1 (High Byte)							
6	FBProcessDataIn2 (Low Byte)							
7	FBProcessDataIn2 (High Byte)							

Note: Process data is sent to the drive independently from the NetRef and NetCtrl bits settings.

Byte 1 of the 101 Output assembly selects which Process Data out selection is read back to the EIP scanner. Bytes 4 through 7 of the 101 Output assembly are application specific.

Select the Multi-purpose application to read data other than what is set as default Process Data.

Default Fieldbus data out selections 1 through 8 are:

1 = Output frequency (hertz)

2 = Motor Speed (rpms)

3 = Motor Current (amps)

4 = Motor Torque (% of nominal motor torque)

5 = Motor Power (% of nominal motor power)

6 = Motor Voltage (Calculated motor voltage)

7 = DC Bus Voltage

8 = Active Fault Code

Multipurpose has a "Fieldbus" group where you reference the FBProcessDataOUT1 through FBProcessDataOUT8 selections. Referring to the 101/107 I/O assembly sheet, bits PDSELx0–PDSELx3 in each "nibble" of Byte 1 of Output Assembly 101 are used to select which FBProcessDataOUT (1–8) you "read" back to your PLC. That is integer 1 through 8 converted to binary Bit 0 through Bit 3. Any parameter or monitored value can be read using the Multi-purpose application, as long as it references a specific ID number. Whichever ProcessDataOutput selector used from 1 through 8 dictates what bits are used in Byte 1 of the output assembly 101. Values are then sent via Input Assembly 107 in Bytes 4 and 5 and Bytes 6 and 7 respectively. If all PDSELxx values are zero, the "Drive state" will be selected at Byte1 location of 107 assembly.

Speed Reference commands for Instances 20, 21, 23, 25 and 101 are set up to send the RPM value. This value is sent based off the Motor Nameplate setting provided in the drive. This would be the direct RPM value written.

Assembly instance 111

Table 157. Instance 111 (Output) length = 20 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		NetRef	NetCtrl	FB Input Data 2	FB Input Data 1	FaultReset	Direction	Run
1	NA							
2	FBSpeedReference (Low Byte) ①							
3	FBSpeedReference (High Byte) ①							
4	ProcessDataIn1 (LowByte)							
5	ProcessDataIn1 (HighByte)							
6	ProcessDataIn2 (LowByte)							
7	ProcessDataIn2 (HighByte)							
8	ProcessDataIn3 (LowByte)							
9	ProcessDataIn3 (HighByte)							
10	ProcessDataIn4 (LowByte)							
11	ProcessDataIn4 (HighByte)							
12	ProcessDataIn5 (LowByte)							
13	ProcessDataIn5 (HighByte)							
14	ProcessDataIn6 (LowByte)							
15	ProcessDataIn6 (HighByte)							
16	ProcessDataIn7 (LowByte)							
17	ProcessDataIn7 (HighByte)							
18	ProcessDataIn8 (LowByte)							
19	ProcessDataIn8 (HighByte)							

① This is the reference1 to the frequency converter. Used normally as Speed reference. The allowed scaling is 0 to 10000. In the application, the value is scaled in percentage of the frequency area between set minimum and maximum frequency. (0 = 0.00%–10000 = 100.00%).

Input instances

Assembly instance 70

Table 158. Instance 70 (Input) length = 4 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0						Running1		Faulted
1								
2	Speed actual (Low Byte), rpm							
3	Speed actual (High Byte), rpm							

Assembly Instance 71

Table 159. Instance 71 (Input) length = 4 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2	Running1	Warning	Faulted
1	Drive state ①							
2	Speed actual (Low Byte), rpm							
3	Speed actual (High Byte), rpm							

① Refer "State transition diagram," provided under "Control Supervisor Object" and "Drive State" table specified at end of "Input Instances" section.

Drive State	
0x00	DN_NON_EXISTANT
0x01	DN_STARTUP
0x02	DN_NOT_READY
0x03	DN_READY
0x04	DN_ENABLED
0x05	DN_STOPPING
0x06	DN_FAULT_STOP
0x07	DN_FAULTED

Assembly instance 73

Table 160. Instance 73 (Input) length = 6 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2	Running1	Warning	Faulted
1	Drive State ①							
2	Speed actual (Low Byte), rpm							
3	Speed actual (High Byte), rpm							
4	Torque actual (Low Byte), Nm							
5	Torque actual (High Byte), Nm							

① Refer "State transition diagram," provided under "Control Supervisor Object" and "Drive State" table specified at end of "Input Instances" section.

Drive State	
0x00	DN_NON_EXISTANT
0x01	DN_STARTUP
0x02	DN_NOT_READY
0x03	DN_READY
0x04	DN_ENABLED
0x05	DN_STOPPING
0x06	DN_FAULT_STOP
0x07	DN_FAULTED

Assembly instance 75

Table 161. Instance 75 (Input) length = 6 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2	Running1	Warning	Faulted
1	Drive State ①							
2	Speed actual (Low Byte), rpm							
3	Speed actual (High Byte), rpm							
4	Process actual (Low Byte), Nm ②							
5	Process actual (High Byte), Nm							

① Refer "State transition diagram," provided under "Control Supervisor Object" and "Drive State" table specified at end of "Input Instances" section.

Drive State	
0x00	DN_NON_EXISTANT
0x01	DN_STARTUP
0x02	DN_NOT_READY
0x03	DN_READY
0x04	DN_ENABLED
0x05	DN_STOPPING
0x06	DN_FAULT_STOP
0x07	DN_FAULTED

② Process actual value is same as process reference. This value will be a 0 to 10000 (100.00%) for use with Analog outputs writing, 0 = 0 or 4 mA and 10000 being 20 mA.

Assembly instance 107

Table 162. Instance 107 (Input) length = 8 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2	Running1	Warning	Faulted
1	Drive State ①/ process data selector value							
2	% Speed Actual (Low Byte) ②							
3	% Speed Actual (High Byte) ②							
4	Process DataOut1 (Low Byte)							
5	Process DataOut1 (High Byte)							
6	Process DataOut2 (Low Byte)							
7	Process DataOut2 (High Byte)							

① Refer "State transition diagram," provided under "Control Supervisor Object" and "Drive State" table specified at end of "Input Instances" section.

Drive State	
0x00	DN_NON_EXISTANT
0x01	DN_STARTUP
0x02	DN_NOT_READY
0x03	DN_READY
0x04	DN_ENABLED
0x05	DN_STOPPING
0x06	DN_FAULT_STOP
0x07	DN_FAULTED

② Speed Actual. This is the actual value from the frequency converter. The value is between 0 and 10000. In the application, the value is scaled in percentage of frequency area between set minimum and maximum frequency. (0 = 0.00%–10000 = 100.00%).

Note: See info on Assembly 101 for varying values in the Process Data Out 1 and Process Data Out 2 Bytes. See **Appendix B** on default Process Data info.

Assembly instance 117

Table 163. Instance 117 (Input). EIP drive status length = 34 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	CtrlFromNet	At Zero Speed	At Reference	Alarm/Warning	Faulted	Direction	Running	Ready
1	NA							
2	% Speed Actual (Low Byte) ①							
3	% Speed Actual (High Byte) ①							
4	RPM Speed Actual (Low Byte) ②							
5	RPM Speed Actual (High Byte) ②							
6	Reserved							
7	Reserved							
8	Reserved							
9	Reserved							
10	Reserved							
11	Reserved							
12	Reserved							
13	Reserved							
14	Reserved							
15	Reserved							
16	Reserved							
17	Reserved							
18	ProcessDataOut1 (LowByte)							
19	ProcessDataOut1 (HighByte)							
20	ProcessDataOut2 (LowByte)							
21	ProcessDataOut2 (HighByte)							
22	ProcessDataOut3 (LowByte)							
23	ProcessDataOut3 (HighByte)							
24	ProcessDataOut4 (LowByte)							
25	ProcessDataOut4 (HighByte)							
26	ProcessDataOut5 (LowByte)							
27	ProcessDataOut5 (HighByte)							
28	ProcessDataOut6 (LowByte)							
29	ProcessDataOut6 (HighByte)							
30	ProcessDataOut7 (LowByte)							
31	ProcessDataOut7 (HighByte)							
32	ProcessDataOut8 (LowByte)							
33	ProcessDataOut8 (HighByte)							

① This is the actual value from the frequency converter. The value is between 0 and 10000.
In the application, the value is scaled in percentage of frequency area between set minimum and maximum frequency. (0 = 0.00%–0000 = 100.00%).

② The RPM Speed Actual is the actual speed of the motor. The unit is RPM.

Note: See Appendix B for Process Data Value defaults.

Assembly instance 127

Table 164. Instance 127 (Input). EIP Drive status length = 20 bytes

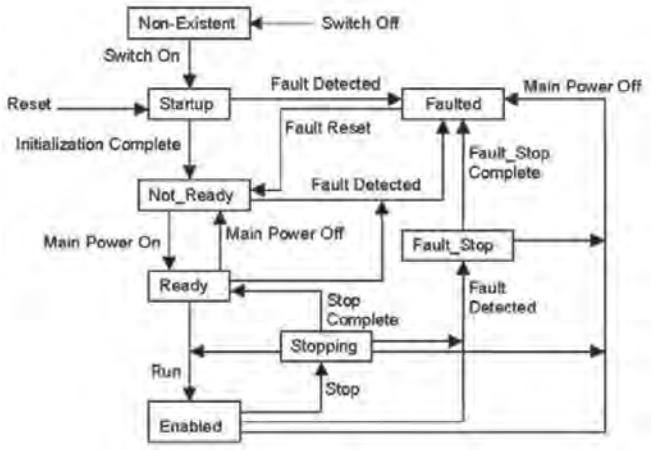
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	CtrlFromNet	At Zero Speed	At Reference	Alarm/Warning	Faulted	Direction	Running	Ready
1	NA							
2	% Speed Actual (Low Byte) ①							
3	% Speed Actual (High Byte) ①							
4	ProcessDataOut1 (LowByte)							
5	ProcessDataOut1 (HighByte)							
6	ProcessDataOut2 (LowByte)							
7	ProcessDataOut2 (HighByte)							
8	ProcessDataOut3 (LowByte)							
9	ProcessDataOut3 (HighByte)							
10	ProcessDataOut4 (LowByte)							
11	ProcessDataOut4 (HighByte)							
12	ProcessDataOut5 (LowByte)							
13	ProcessDataOut5 (HighByte)							
14	ProcessDataOut6 (LowByte)							
15	ProcessDataOut6 (HighByte)							
16	ProcessDataOut7 (LowByte)							
17	ProcessDataOut7 (HighByte)							
18	ProcessDataOut8 (LowByte)							
19	ProcessDataOut8 (HighByte)							

① This is the actual value from the frequency converter. The value is between 0 and 10000. In the application, the value is scaled in percentage of frequency area between set minimum and maximum frequency. (0 = 0.00%–10000 = 100.00%).

Note: See **Appendix B** for Process Data Value defaults.

Network state machine

Figure 54. Network state machine



Start Forward, Start Reverse, Change to Forward, Change to Reverse, and stop is static outputs of the Control Supervisor state machine.

EDS file

EDS is the abbreviation for Electronic Data Sheet, a file on disk that contains configuration data for specific device types. You can provide configuration support for your device by using a specially formatted ASCII file, referred to as the EDS.

The information in an EDS allows configuration tools to provide informative screens that guide a user through the steps necessary to configure a device. An EDS provides all of the information necessary to access and alter the configurable parameters of a device. This information matches the information provided by instances of the parameter object class. The CIP object library describes the parameter object class in detail.

Explicit messaging

Explicit messaging is used in commissioning and parameterizing the DeviceNet board and device. It is a tool used to provide multi-purpose, point-to-point communication paths between two devices. They provide the typical request/response-oriented network communication used to perform node configuration and problem diagnosis. Explicit messages are low priority identifiers and contain the specific meaning of the message right in the data field.

List of object classes

The communication interface supports the following object class.

Table 165. List of object classes

Class	Object	Remark
0x01	Identity objects	Cip required object
0x03	DeviceNet object	Cip required object
0x04	Assembly object	CIP object for drive device
0x05	Connection object	Communication object
0x28	Motor Data object	CIP object for drive device
0x29	Control supervisor object	CIP object for drive device
0x2A	AC/DC drive object	CIP object for drive device
0xA0~0xBB	Vendor parameters object	Vendor specific
0x96	Base device information object	Vendor specific

List of services

The Service supported by these object classes are shown below.

Table 166. List of services

		Identity object		Message router		DeviceNet		Assembly		Connection		Motor data		Control supervisory		AC/DC Drive		Other objects	
Service Code (in hex)	Service Name	Class	Inst	Class	Inst	Class	Inst	Class	Inst	Class	Inst	Inst	Inst	Class	Inst	Class	Inst	Class	Inst
05	Reset (Type 0, 1)	—	Y	—	—	—	—	—	—	—	—	—	—	—	Y*	—	—	—	—
0E	Get_attribute_single	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10	Set_attribute_single	—	—	—	Y	—	Y	—	Y	—	Y	Y	Y	—	Y	—	Y	—	Y
14	Error Response	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4B	Allocate_Master/ Slave_Connection_Set	—	—	—	—	—	Y	—	—	—	—	—	—	—	—	—	—	—	—
4C	Release_Master/ Slave_Connection_Set	—	—	—	—	—	Y	—	—	—	—	—	—	—	—	—	—	—	—

* Control Supervisory has only Type 0 service.

List of data types

The attribute list that follows includes information on the Data Type of each attribute. The following tables explain the Data, Structure, and Array Type codes used in the Data Type column.

Following data types are supported.

Table 167. List of data types

Data type name	Data type code object	Data type description
BOOL	C1	Logical Boolean with values TRUE and FALSE
SINT	C2	Signed 8-bit integer value
INT	C3	Signed 16-bit integer value
USINT	C6	Unsigned 8-bit integer value
UINT	C7	Unsigned 16-bit integer value
UDINT	C8	Unsigned 32-bit integer value
BYTE	D1	Bit string = 8-bits
WORD	D2	Bit string = 16-bits
SHORT_STRING	DA	Character string (1 byte per character, 1 byte length indicator)
REAL	CA	32-bit floating point value
SHORT_STRING	DA	Character string (1 byte per character, 1 byte length indicator)

Reset service

The following table lists the different types of resets supported by the identity object.

Resetting the drive interface to its out-of-box configuration will change the response of the drive to a loss of communications with the drive. The devices will have to be re-configured for your application before resuming normal operation.

Table 168. Reset service

Value	Reset description
0	Initializes drive to the Power-up state. (Soft reset)
1	Writes default values to all instance attributes then saves all non-volatile attributes to FLASH memory and then performs the equivalent of a Reset (0). (Factory Reset)

Common industrial objects implemented by PowerXL DG1 DeviceNet

CIP common required objects

Identity object, class 0x01

This object provides identification of and general information about the drive.

Table 169. Identity Object, Class 0x01

Object descriptions					
Class attributes					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Remarks/Default**
01h	Revision	NV	UINT	Get	1
Class services					
ID	**Service**				
0Eh	Get_attribute_single				
Instance attribute					
ID	**Description**	**NV**	**Data type**	**Access rule**	
01h	Vendor ID	NV	UINT	Get	68 (Eaton Vendor ID)
02h	Device Type	NV	UINT	Get	2 (AC Drive)
03h	Product Code	NV	UINT	Get	0x3019
04h	Revision	NV	Struct of:	Get	
	Major Revision		USINT		
	Minor Revision		USINT		As Device Version
05h	Status	V	WORD	Get	Refer **Table 168**
06h	Serial Number	NV	UDINT	Get	Runtime = 0
07h	Product Name	NV	SHORT_STRING	Get	PowerXL VFD DeviceNET Comm. Card
Instance services					
ID	**Service**				
Id	Service				
0Eh	Get_attribute_single				
05h	Reset				0, 1

Table 170. Bit definitions for status instance attribute of identity object

Bits	Called	Definitions
0	Owned	TRUE indicates the device (or an object within the device) has an owner. Within the Master/Slave paradigm the setting of this bit means that the Predefined Master/Slave Connection Set has been allocated to a master.
1	Reserved	Reserved, shall be 0
2	Configured	TRUE indicates the application of the device has been configured to do something different than the "out-of-box" default. This shall not include configuration of the communications.
3	Reserved	Reserved, shall be 0
4–7	Extended device status	Vendor-specific or as defined by **Table 179**.
8		Not used
9		Not used
10		Not used
11		Not used
12–15	Extended device status 2	Reserved—(shall be 0)

Table 171. Values for extended device status field (Bits 4–7) in status instance attribute

Value	Description
0	Self-Testing or Unknown
2	At least one faulted I/O connection
3	No I/O connections established
6	At least one I/O connection in run mode
7	At least one I/O connection established, all in idle mode

Connection object, class 0x05

Table 172. Connection object, class 0x05

Object descriptions						
Class attributes						
ID	**Description**	**NV**	**Data type**	**Access rule**	**Default**	**Range**
1	Revision	NV	UINT	Get	1 ①	1
Class services						
ID	**Service**			**Requirements**		
0Eh	Get_attribute_single					
Instance attribute						
ID	**Description**	**NV**	**Data type**	**Access rule**	**Default**	**Range**
1	State		USINT	Get		
2	Instance type		USINT	Get		
3	Transport class trigger		BYTE	Get		
4	Produced connection id		UINT	Get		
5	Consumed connection id		UINT	Get		
6	Initial comm characteristics		BYTE	Get		
7	Produced connection size		UINT	Get		
8	Consumed connection size		UINT	Get		
9	Expected packet rate		UINT	Get/Set		
12	Watchdog timeout action		USINT	Get/Set		
13	Produced connection path length		UINT	Get		
14	Produced connection path		Packed EPATH	Get		
15	Consumed connection path length		UINT	Get		
16	Consumed connection path		Packed EPATH	Get		
Instance services						
ID	**Service**					
0Eh	Get_attribute_single					
10h	Set_attribute_single					

① Default values as per stack.

DeviceNet object, class 0x03

Table 173. DeviceNet object, class 0x03

Object descriptions					
Class attributes					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Remarks/Default**
01h	Revision	NV	UINT	Get	02h
Class services					
ID	**Service**				
0Eh	Get_attribute_single				
Instance attribute					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Remarks/Default**
1	MAC ID	NV	USINT	Get/Set	63, (0–63)
2	Baud rate	NV	USINT	Get/Set	0 (0–125,1–250, 2–500 K)
5	Allocation information	V	STRUCT of:	Get	
	Allocation choice byte		BYTE		Bit 0 = Explicit Bit 1 = Poll
	Master's MAC ID		USINT		1 Range 0–63, 255 Modified via Allocate only
Instance services					
ID	**Service**				
0Eh	Get_attribute_single				
10h	Set_attribute_single				

Objects present in an AC/DC drive

Assembly object, class 0x04

Table 174. Assembly object, class 0x04

Object descriptions					
Class attributes					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Remarks/Default**
01h	Revision	V	UINT	Get	2
02h	Max instance	V	UINT	Get	0x7F
03h	Number of instances	V	UINT	Get	0x0D
04h	Optional attribute list	V	Struct of:	Get	
	Number of attributes	V	UINT		1
	Array of attributes	V	Array of UINT		04 00
06h	Maximum ID class attribute	V	USINT	Get	07 00
07h	Maximum ID instance attribute	V	USINT	Get	04 00
Class services					
ID	**Service**				
0Eh	Get_attribute_single				
Instance attribute					
ID	**Description**		**Data type**	**Access rule**	
3	Data	V	Array of BYTES	Get/Set	
Instance services					
ID	**Service**				
10h	Set_attribute_single				
0Eh	Get_attribute_single				

Motor data object, class 0x28

Table 175. Motor data object, class 0x28

Object descriptions					
Class attributes					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Remarks/Default**
1	Revision	NV	UINT	Get	1
2	Max instance	NV	UINT	Get	3
3	Number of instances	NV	UINT	Get	3
Class services					
ID	**Service**				
0Eh	Get attribute single				
Instance 1 attributes					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Default Min. Max.**
03h	Motor type ①	NV	USINT	Get	Squirrel cage Induction Motor (7)
06h	Rated current	NV	UINT	Get	②
07h	Rated voltage	NV	UINT	Get	②
09h	Rated frequency	NV	UINT	Get	②
0Ch	Pole count ①	NV	UINT	Get	②
0Fh	Base speed	NV	UINT	Get	②
Instance 2 attributes					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Remarks/Default**
06h	First rated current	NV	UINT	Get/Set	②
07h	First rated voltage	NV	UINT	Get/Set	②
09h	First rated frequency	NV	UINT	Get/Set	②
0Ch	First pole count	NV	UINT	Get	②
0Fh	First base speed	NV	UINT	Get/Set	②
Instance 3 attributes					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Remarks/Default**
06h	Second rated current	NV	UINT	Get/Set	②
07h	Second rated voltage	NV	UINT	Get/Set	②
09h	Second rated frequency	NV	UINT	Get/Set	②
0Ch	Second pole count	NV	UINT	Get	②
0Fh	Second base speed	NV	UINT	Get/Set	②
Instance services					
ID	**Service**				
0Eh	Get_attribute_single				
10h	Set_attribute_single				

① Instance 1 Motor type and Pole count are also part of instance 2 and instance 3.
② Refer the application manual for the default values of the motor data attribute parameters.

Control supervisor object, class 0x29

This object models all the management functions for devices within the "Hierarchy of Motor Control Devices." The behavior of motor control devices is described by the State Transition Diagram.

Table 176. Control supervisor object, class 0x29

Object descriptions						
Class attributes						
ID	**Description**	**NV**	**Data type**	**Access rule**	**Default**	**Range**
01h	Revision	NV	UINT	Get	1	—
02h	Max instance	NV	UINT	Get	1	—
03h	Number of instances	NV	UINT	Get	1	—
Class services						
ID	**Service**			**Requirements**		
0Eh	Get attribute single					
Instance attribute						
ID	**Description**	**NV**	**Data type**	**Access rule**		
03h	Run1	V	BOOL	Get/Set	0	0–1
04h	Run2	V	BOOL	Get/Set	0	0–1
05h	NetCtrl	V	BOOL	Get/Set	0	0–1
06h	State	V	USINT	Get	0	0–7
07h	Running1	V	BOOL	Get	0	0–1
08h	Running2	V	BOOL	Get	0	0–1
09h	Ready	V	BOOL	Get	0	0–1
0Ah	Faulted	V	BOOL	Get	0	0–1
0Bh	Warning	V	BOOL	Get	0	0–1
0Ch	FaultRst	V	BOOL	Get/Set	0	0–1
0Fh	CtrlFromNet	V	BOOL	Get	0	0–1
0Dh	Active fault code ①	V	UINT	Get	0	0–65535
6Ch	Comm idle action value ②	NV	USINT	Get/Set	2	0–2
6Dh	Comm timeout	NV	UINT	Get /Set	10 sec	0-60 sec
Instance services						
ID	**Service**					
0Eh	Get_attribute_single					
10h	Set_attribute_single					
05h	Reset					Type 0

① See **Appendix C** for Active list of fault codes.
② Modification of Attribute 0x6C of Supervisory.

- Default value for this attribute to be Fault on idle Communication mode
- This attribute to have 3 values as
  - 0 = No Action (Hold Last State) in Idle Communication mode
  - 1 = Stop Motor in Idle Communication mode
  - 2 = Fault Motor in Idle Communication mode

AC/DC Drive Object, Class 0x2A

This object models the functions specific to an AC or DC drive, e.g., speed ramp, torque control and so on.

Table 177. AC/DC drive object, class 0x2A

Object descriptions					
Class attributes					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Default**
01h	Revision	NV	UINT	Get	1
02h	Max Instance	NV	UINT	Get	1
03h	Number of instances	NV	UINT	Get	1
Class services					
ID	**Service**				
0Eh	Get_attribute_single				
Instance attribute					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Default Min. Max.**
03h	AtReference	V	BOOL	Get	0
04h	NetRef	V	BOOL	Get/Set	0
06h	DriveMode	V	USINT	Get	0
07h	SpeedActual	V	INT	Get	0
08h	SpeedRef	V	INT	Get/Set	0
0Bh	TorqueActual	V	INT	Get	0
0Ch	TorqueRef	V	INT	Get/Set	0
1Dh	RefFromNet	V	BOOL	Get	0
12h	Accel time	V	UINT	Get	①
13h	Decel time	V	UINT	Get	①
0Ah	Current limit	NV	INT	Get/Set	①
64h	Accel time 1	NV	UINT	Get/Set	①
65h	Accel time 2	NV	UINT	Get/Set	①
66h	Decel time 1	NV	UINT	Get/Set	①
67h	Decel time 2	NV	UINT	Get/Set	①
1Ch	Time scale	NV	SINT	Get/Set	①
Instance services					
ID	**Service**				
0Eh	Get_attribute_single				
10h	Set_attribute_single				

① Varies based off drive parameter settings.

AC/DC drive object

Note: Refer to the drive application manual for the default values of the parameters.

Vendor parameters object, class 0xA0~0xBB

PowerXL DG1 shall support Vendor Parameters Object, Class 0xA0 through 0xBB as given in table below. Vendor Parameter object is used in order to get access to drive parameters. Please refer to **Appendix A** for Class, Instance and Attribute values for each parameter.

Table 178. Vendor parameters object, class 0xA0, 0xA1, 0xA2, 0xA3, ---- 0xBB

Object descriptions					
Class attributes					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Remarks/Default**
01h	Revision	NV	UINT	Get	1
02h	Max Instance	NV	UINT	Get	1
03h	Number of Instances	NV	UINT	Get	Varies for different objects
Class services					
ID	**Service**				
0Eh	Get_attribute_single				
Instance attribute					
ID	**Description**			**Access rule**	
Varies for different objects					
Instance services					
ID	**Service**				
0Eh	Get_attribute_single				
10h	Set_attribute_single				

Base device information object, class 0x96

Base device Information Object is used in order to get information about the Base Device to which this option card is connected.

Table 179. Base device information object

Object descriptions					
Class attributes					
ID	**Description**	**NV**	**Data type**	**Access rule**	**Default/Remark**
01h	Revision	NV	UINT	Get	1
02h	Max instance	NV	UINT	Get	1
03h	Number of instances	NV	UINT	Get	1
Class services					
ID	**Service**				
0Eh	Get_attribute_single				
Instance attribute					
ID	**Description**	**NV**	**Data type**	**Access rule**	
01h	Product name	NV	SHORT_STRING	Get	"PowerXL DG1"
02h	Firmware revision	NV	Struct of:	Get	
	Major revision		USINT		As read from device
	Minor revision		USINT		
03h	Hardware version	NV	USINT	Get	0xXX
04h	Product code	NV	UINT	Get	0x3000
05h	Serial number	NV	UDINT	Get	Runtime = Read from the board
Instance services					
ID	**Service**				
0Eh	Get_attribute_single				

SmartWire-DT External Communication Cards

SmartWire-DT is an intelligent wiring system and makes for a reliable and easy connection of switching devices, pilot devices and I/O components with overriding bus systems possible. The components that are connected with SmartWire-DT are linked, e.g. to SMARTWIRE-DT -DP or CANopen communication networks via gateways using SmartWire-DT masters.

With the SmartWire-DT system, up to 99 modules can be connected to form a network. Modules can include SmartWire-DT I/O modules or SmartWire-DT modules for contactors, soft starters, drives or pilot devices. The electrical connection is effected via a special 8-pole connecting cable and the relevant plugs.

When equipped with a DXG-NET-SWD; SmartWire-DT interface module, the variable frequency drives can be connected to a SmartWire-DT system and, as a result, to a higher-level PLC. SmartWire-DT can then be used to configure, control, and monitor these devices.

Line length depends on different transmission speeds.

Table 181. Line length

A SmartWire-DT network can have a length of up to 600 m. The actual maximum length will depend on the baud rate and cable type (ribbon cable or round cable) being used.

Baud rate	Ribbon cable	Round cable (5-pole)
125KB	600m	600m
250KB	600m	600m

SmartWire-DT specifications

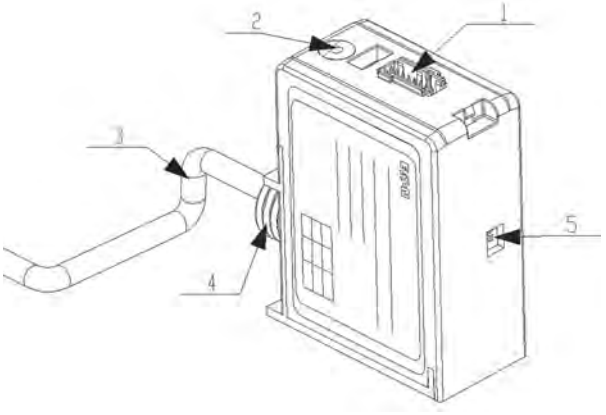
Table 180. SmartWire-DT technical data

Items	Value
Electrical and thermal safety standards	UL 508C, CSA C22.2 IEC/EN 61800-5-1
Ambient Operating Temperature	-10°C to +50°C IH, with de-rating up to 60 °C
Storage Temperature	-40°F (-40°C) to 158°F (70°C)
Vibration	1G at 15.8—150 Hz
Interface Connector	8-pin Flat Connector/5-pin M12 Connector
Transfer cable	IP20: SmartWire-DT 8-pin ribbon cable IP54: 5 pin round cable
Max. current consumption	IP20: 75mA@15VDC IP54: 75mA@24VDC

Hardware specifications

PowerXL DG1 Series has two SmartWire-DT communication modules, "DXG-NET-SWD-IP20" for IP20 and "DXG-NET-SWD-IP54" for IP54

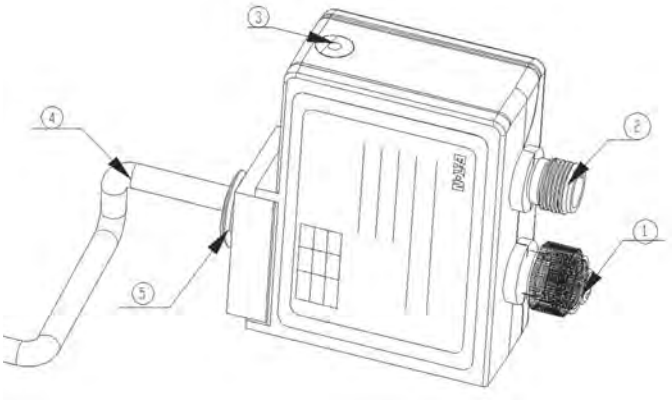
Figure 55. SmartWire-DT "DXG-NET-SWD-IP20" module details



1. Connection of SmartWire-DT external device plug
2. SmartWire-DT dignostics LED
3. Modbus cable
4. Mounting screw
5. Selection DIP Switch

Figure 56. SmartWire-DT "DXG-NET-SWD-IP54" module details

The following drawing shows the DXG-NET-SWD-IP54 SmartWire-DT Communication Module



1. Connection of SmartWire-DT external device plug out
2. Connection of SmartWire-DT external device plug in
3. SmartWire-DT dignostics LED
4. Modbus cable
5. Mounting screw

LEDs

SmartWire-DT LEDs are as stated below

Table 182. SmartWire-DT Diagnostic LED

Color	Status	Meaning
Green	LED flashes slowly (1Hz).	Device is active, but it is not coupled to the SWD bus.
Green	LED flashes quickly (3Hz).	An error condition was discovered. Device may or may not be in normal operation.
Green	LED is turned on continuously.	Device is in normal operation

Connector details

SmartWire-DT "DXG-NET-SWD-IP20" module uses 8 core flat cable whereas SmartWire-DT "DXG-NET-SWD-IP54" module uses 5 core round cable

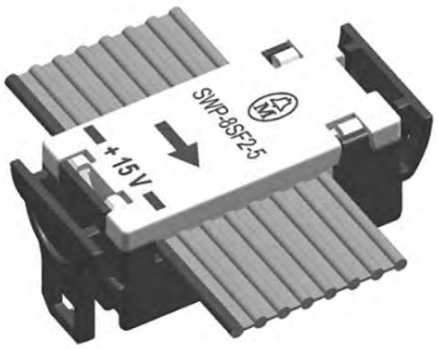


Figure 57. 8 core flat cable and pin assignment

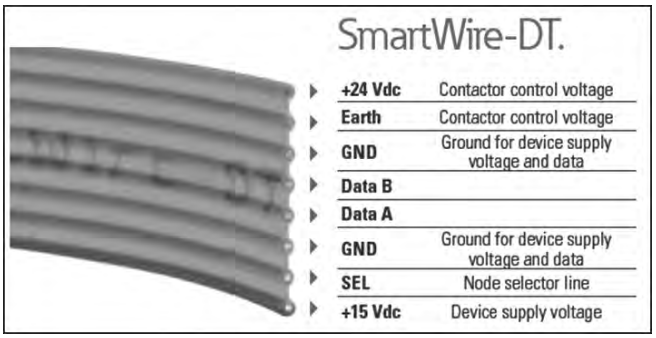


Figure 58. 5 core round cable and pin assignment

SACC-E-MS-5CON-M16/0,5 SCO - 1520055

Schematic diagram

Pin assignment M12 male connector, 5-pos., A-coded, male side

Male connector (pins) = Smartwire IN

Pin 1: -24VDC

Pin 2: Smartwire A

Pin 3: 0VDC

Pin 4: Smartwire B

Pin 5: SEL In

SmartWire-DT cable

Table 183. Recommendation for 8 core flat cable

8-pin SWD4-8MF2 ribbon connectors need to be connected at the beginning and at the end of the ribbon cable.

Ribbon cables are available in various lengths and configurations. See table below:

Flat band conductor	Description
SWD4-100LF8-24	100-m long roll for making custom SmartWire-DT cables
SWD4-3LF8-24-2S SWD4-5LF8-24-2S SWD4-10LF8-24-2S	Prefabricated cable (with lenght of 3, 5, or 10m) with two 8-pin SWD4-8MF2 ribbon connectors

All SmartWire-DT modules inside a control panel need to be connected to the ribbon cable using an 8-pin SWD4-8SF2-5 external device plug.

Figure 59. External device plug SWD4-8SF2-5

Table 184. Recommendation for 5 core round cable

The SmartWire-DT round cable is used as a connecting cable for connecting to the SmartWire-DT communication system. The SmartWire-DT round cable is the only way to guarantee error-free transmissions up to the maximum possible SmartWire-DT network length of 600 m.

Prefabricated cables with two M12 plug connectors (socket, plug)

Cable	Description
SWD4-M1LR5-2S	SWD cable, 5-pole, 0.1m, M12-M/M12-F
SWD4-M3LR5-2S	SWD cable, 5-pole, 0.3m, M12-M/M12-F
SWD4-M6LR5-2S	SWD cable, 5-pole, 0.6m, M12-M/M12-F
SWD4-1LR5-2S	SWD cable, 5-pole, 1.0m, M12-M/M12-F
SWD4-1M5LR5-2S	SWD cable, 5-pole, 1.5m, M12-M/M12-F
SWD4-2LR5-2S	SWD cable, 5-pole, 2.0m, M12-M/M12-F
SWD4-3LR5-2S	SWD cable, 5-pole, 3.0m, M12-M/M12-F
SWD4-5LR5-2S	SWD cable, 5-pole, 5.0m, M12-M/M12-F
SWD4-10LR5-2S	SWD cable, 5-pole, 10.0m, M12-M/M12-F

Gateways for using SmartWire-DT module

The DXG-NET-SWD SmartWire-DT interface module's interoperability is guaranteed with the following SmartWire-DT gateway versions (and higher):

Table 185. Firmware versions of SmartWire-DT gateways

SmartWire-DT gateway	Firmware Version
EU5C-SWD-CAN	V 1.30
EU5C-SWD-DP	V 1.30

Fieldbus description files

The DXG-NET-SWD SmartWire-DT interface module's interoperability is guaranteed with the following versions (and higher) of the fieldbus description file for the gateways listed below

Table 186. Compatible field bus description files

SmartWire-DT gateway	Description file
EU5C-SWD-CAN	from EU5C-SWD-CAN_V130.eds Rev.42
EU5C-SWD-DP (Intel-based CPU)	from Moel14.gsd (V. 1.19)
EU5C-SWD-DP (Motorola-based CPU)	from Moel14.gsd (V. 1.18)
SWD master (i. e. XV100)	from ASIC FW Version 2.01 Build: 0081

SWD-Assist

The SWD-Assist program provides valuable support in the engineering of your SmartWire-DT topology. SWD-Assist is software that runs under operating systems Windows 2000 (SP 4), Windows XP, Windows Vista (32-bit) or Windows 7 and relieves you of the planning work required for an SWD topology.

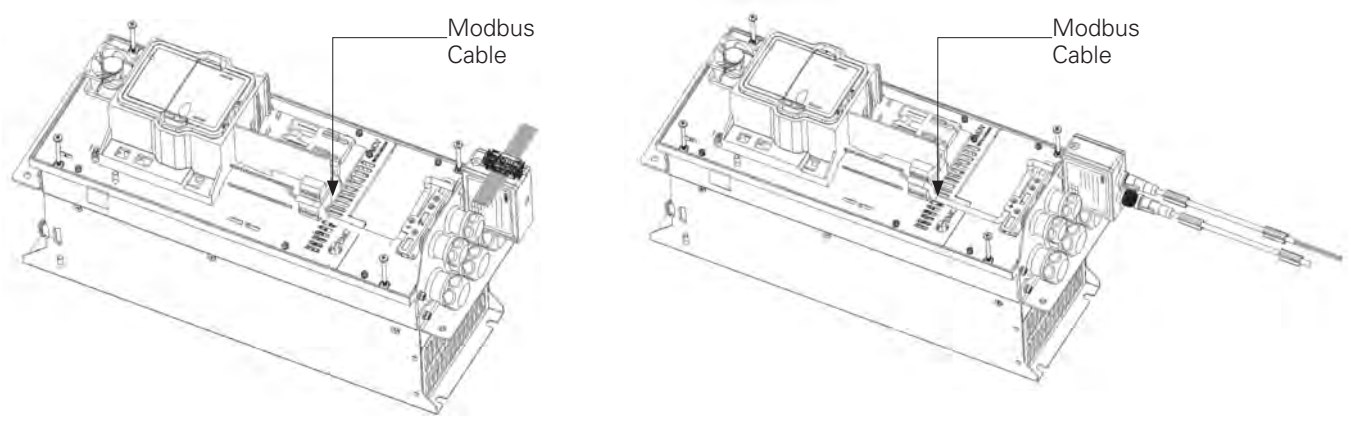
The DX-NET-SWD… SmartWire-DT interface module can be used in SWD-Assist version V 2.50 and higher.

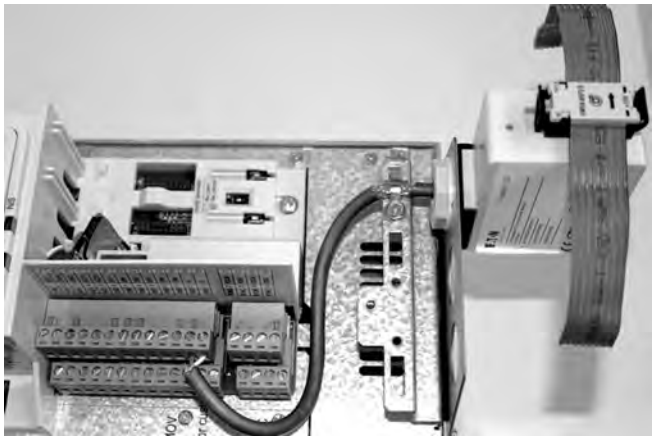
The SWD-Assist program can be downloaded for free on the Internet at: http://downloadcenter.moeller.net

Connection of SmartWire-DT module to drive

SmartWire-DT "DXG-NET-SWD-IP20" &
"DXG-NET-SWD-IP54" modules are attached to PowerXL DG1 drive at the bottom cable insert area as shown below.

Figure 60. Connection of SmartWire-DT module to PowerXL DG1 Drive





SMARTWIRE-DT module shall connect to the PowerXL DG1 main unit using the Modbus RTU field bus on the drive control board as marked in the above pictures

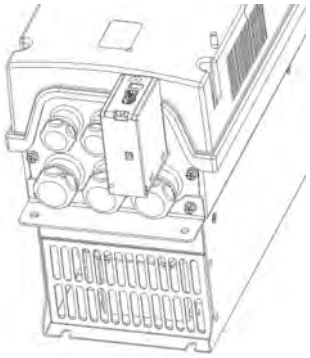
Installation

Mounting

Mounting of SmartWire-DT "DXG-NET-SWD-IP20" module

DXG-NET-SWD-IP20 modules can be installed in PowerXL DG1 VFD with an IP20 degree of protection.

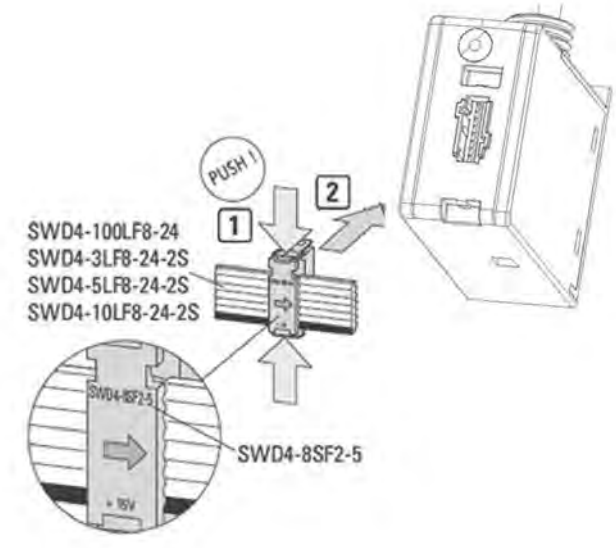
Figure 61. Mounting of SmartWire-DT "DXG-NET-SWD-IP20" module on PowerXL DG1 Drive



Connection of SmartWire-DT flat cable

Connect the SWD external device plug SWD4-8SF2-5 with the adapted SmartWire-DT ribbon cable

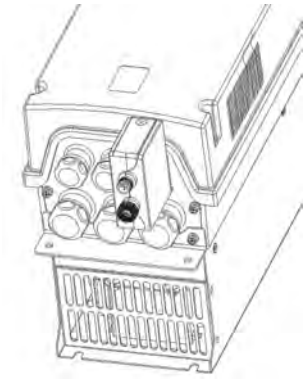
Figure 62. Connection of flat cable with SmartWire-DT "DXG-NET-SWD-IP20" module



Mounting of SmartWire-DT "DXG-NET-SWD-IP54" module

DXG-NET-SWD-IP54 modules can be installed in PowerXL DG1 variable frequency drive with an IP54 degree of protection.

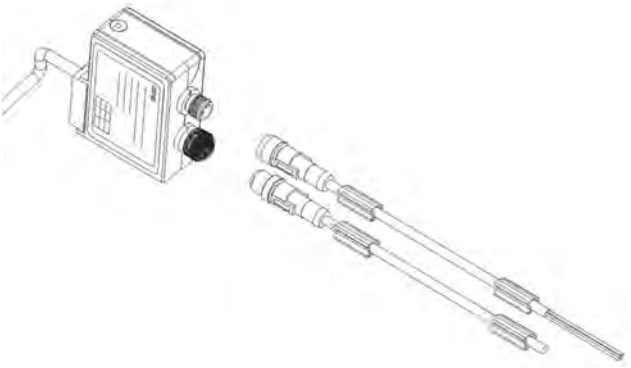
Figure 63. Mounting of SmartWire-DT "DXG-NET-SWD-IP54" module on PowerXL DG1 Drive



Connection of SmartWire-DT round cable

Connect the SWD external device plug SWD4-8SF2-5 with the adapted SmartWire-DT ribbon cable

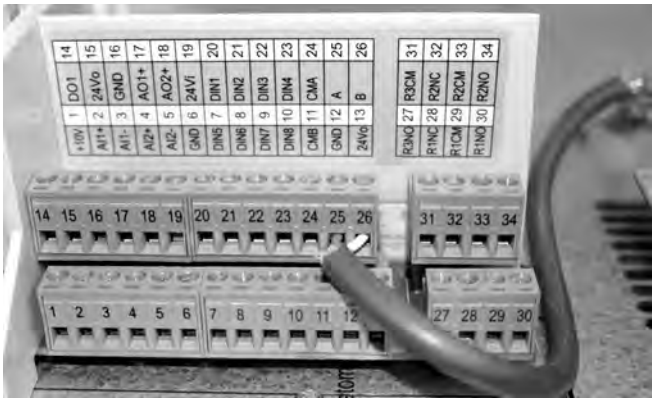
Figure 64. Connection of round cable with SmartWire-DT "DXG-NET-SWD-IP54" module



Commissioning

The SmartWire-DT module is commissioned by connecting it to the RS-485 communication port via the A and B terminals on the drives control board. Once the module is connected to the terminal, select "SWD" from keypad menu "RS485 Comm Set". The keypad will now start showing SWD menu as shown below in table 188. The device will recognize it and will show a warning for "Device Added." This warning will be shown for 5 seconds and will be cleared.

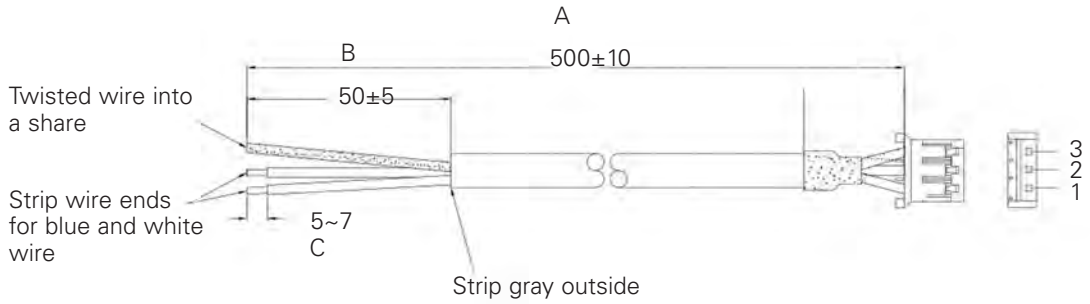
Figure 66. Connection of SmartWire-DT module with PowerXL DG1 Drive



SWD Board	Black	Blue	White
PowerXL DG1 Control Board	Ground	A	B

Figure 67. Recommended wire lengths

The following diagram and table are the recommended wire lengths by frame size. Actual cable length is dependent on customer cable route.



A connection	
Shielded braid wire to ground	1
Blue	2
White	1

Table 187. Recommended cable lengths

	A (Length of recommended gray wire)	B (Length of recommended strip length for gray insulation cable)	C (Length of recommended strip length for blue and white wire)
Frame 1	200mm	50mm	5-7mm
Frame 2	250mm	50mm	5-7mm
Frame 3	350mm	50mm	5-7mm
Frame 4	450mm	50mm	5-7mm
Frame 5	500mm (no change)	50mm	5-7mm
Frame 6	500mm (no change)	50mm	5-7mm

SmartWire-DT parameters

Once the module is detected, following parameters can be set on keypad for the SmartWire-DT

Figure 68. SmartWire-DT parameter menu

SWD parameters menu:

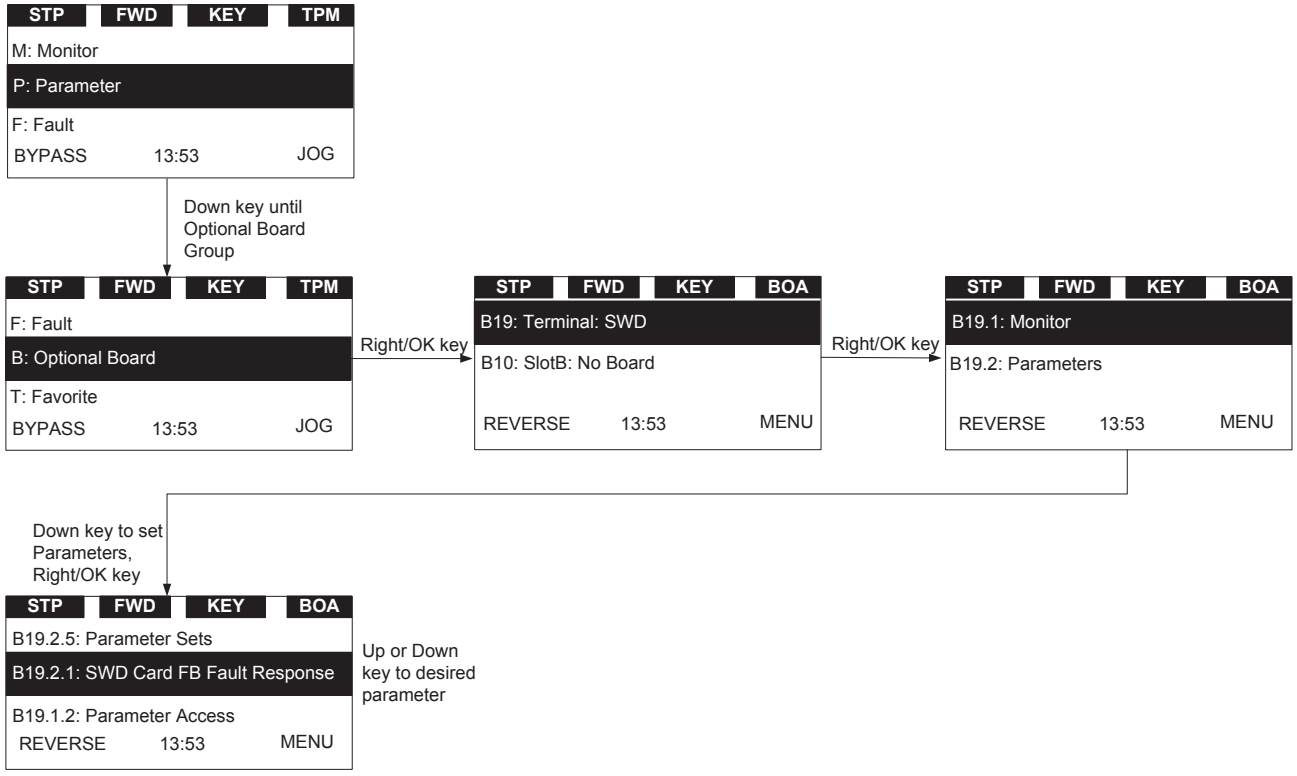


Table 188. SmartWire-DT parameters

Code	Parameter	Min.	Max.	Unit	Default	ID	Note
B19	**Terminal: SWD**						
B19.1	**Monitor**						
B19.1.1	**Device Parameters**						
BX.1.1.1	Board Status				0		B0 = DCOM Comm. Fault
							B1 = Board HW Fault
							B2 = NA for SMDT card
							B3 = Fieldbus Fault
							B4 = Reserved
BX.1.1.2	Firmware Version						V1.01.0009
BX.1.1.3	Protocol Status				0		0=Not Configured
							1=Operational
							2=Diagnostics
BX.1.1.4	Operation Mode				0		0=PD2x16Bit Profile
							1=8Bit Profile
							2=1-0-A Switch
BX.1.1.5	PDP-Telegram Selection	1	1		1		1=Standard Telegram 1
BX.1.1.6	Fault Counter PDP	0	65535				
BX.1.1.7	Fault Situations Max				8x8		
BX.1.1.8	PDP-Profil Number				341		
BX.1.1.9	PDP-Control Word	0x0000	0xFFFF				
BX.1.1.10	PDP-Status Word	0x0000	0xFFFF				
BX.1.2	**Parameter Access**						
BX.1.2.1	PDP-MaxBlockLength				30		
BX.1.2.2	PDP-NoOfMultiparameter				1		
BX.1.2.3	PDP-MaxLatency				2		
BX.1.3	**DO Identification**						
BX.1.3.1	PDP-DO Manufacturer				0x019D		
BX.1.3.2	PDP-DO Device Type				0x3000		
BX.1.3.3	PDP-DO FW-Interface						01.03
BX.1.3.4	PDP-DO FW-Year						2017
BX.1.3.5	PDP-DO FW-DayMonth						1602
BX.1.3.6	PDP-DO NoOfDOs				1		
BX.1.3.7	PDP-DO Subclass				1		
BX.2	**Parameters**						
BX.2.3	SWD. Card FB Fault Response	0	1		0		

Table 188. SmartWire-DT parameters, continued

Code	Parameter	Min.	Max.	Unit	Default	ID	Note
BX.2.4	Parameter Access	0	1		1		PNU927 specifies the Operation priority of parameters for Acyclic communication 0 = No permission of ProfiBus Cyclic communication 1 = ProfiBus has Cyclic communication priority
BX.2.5	Process Data Access	0	5		4		PNU928 specifies the control priority of the device for Cyclic communication 1=Fieldbus; 2=NET Control, Local Ref; 4=NET, Local on Fault; 5=NET & Local CMD;
BX.2.6	Fault Situation Counter				0		
BX.2.7	Parameter Sets	0	7		0		

SmartWire-DT – PowerXL DG1 Series

General

Cyclic and acyclic data as well as diagnostic data can be transferred via the SmartWire-DT system. The number of cyclic data is variable and is defined with the aid of profiles. The cyclical and acyclical data used by PowerXL DG1 variable frequency drives has been designed in such a way as to match the following profiles and meet the following standards:

- The standard specified by SmartWire-DT,
- The PROFIdrive profile

The appropriate profile can be selected by the user

Operation mode

The parameter Operation Mode B19.1.1.4 above shows the mode in which SmartWire-DT module is working.

PD2x16Bit Profile

This group supplements the variable frequency drive profile with the PROFIdrive profile as the PNO has defined for the cyclic data-exchange with a drive. Control and status data will be processed according to the PROFIdrive profile.

8Bit Profile

Control and status data will be processed as per the I/O link profile.

1-0-A Switch

The drive is controlled by dip switch to test the functionality. The 1-0-A switch's positions are as follows:

- 1: Variable frequency drive is activated
- 0: Variable frequency drive deactivated
- A: switching command via SmartWire-DT

Note: Intermediate 1-0-A switch positions are not permitted, and will have no defined function.

PowerXL DG1 SmartWire-DT interface

PowerXL DG1 has SmartWire-DT profile 4.1, which allows –

- Direct control of the drive using PROFIBUS Master
- Full access to all drive parameters

Cyclic Data

The amount of cyclical input/output data (process data) for the variable frequency drive can be adjusted as necessary for the application at hand by using the various profiles. These profiles can be selected in the hardware/PLC configuration program (in the SWD-Assist program).

Table 189. Cyclic profile data

Profile	Input Bytes (Status)						Output Bytes (Control)						Bytes
	0	1	2	3	4	∑	0	1	2	3	4	∑	∑
DXG-NET-SWD 8 bit	SMARTWIRE-DT	FU				1+1	SMARTWIRE-DT	FU				1+1	4
DXG-NET-SWD PD 2 x 16-Bit	SMARTWIRE-DT	FU	FU	FU	FU	1+4	SMARTWIRE-DT	FU	FU	FU	FU	1+4	10

Control Word and Status Word

Profile 1 (8 bit): Inputs (Status)

Table 190. Profile 1: input bytes 0 and 1

Byte	Bit	Designation	Meaning
0	0	--	NA
	1	--	NA
	2.3	A1, A2	1-0-A switch on DXG-NET-SWD
			00 = Pos. A(utomatic)
			01 = Pos. 0 (off)
			10 = Pos. 0 (off)
			11 = Pos. 1 (on)
	4	DIAG	Diagnostics present
	5	--	NA
	6	PRSNT	Device present
	7		NA
1	0	ERR	**Error present** 0: no error 1: Error Indicates whether there is a variable frequency drive fault. If there is one, the device will respond as configured in PNU **840.29953**
	1	WARN	**Warning present** 0: no warning 1: Warning Indicates whether there is a variable frequency drive warning.
	2	RDY	**Ready, switched on** 0: not switched on 1: switched on Indicates Power supply is switched on, electronics initialized, main contact, if available, has dropped out, pulses are inhibited.
	3	RUN	**Run** 0: not running 1: running Indicates Drive follows set point. This means, that the electronic and pulses are enabled
	4	f-Level	Actual speed is greater than the signaling threshold 0: Actual speed is less than or equal to the signaling threshold 1: Actual speed is greater than the signaling threshold If the actual speed is greater than the value set on relay output 1, the value will be 1. Otherwise, it will be 0.
	5	Q5 (Output 1)	Q5 (Output 1)
	6	Q6 (Output 2)	Q6 (Output 2)
	7	Q7 (Output 3)	Q7 (Output 3)

Profile 1 (8 bit): Outputs (Control)

Table 191. Profile 1: Output bytes 0 and 1

Byte	Bit	Designation	Meaning
0	0	FWD	**Start Reverse** A value of 1 will start the variable frequency drive in the clockwise operating direction
	1	REV	**Start anticlockwise operation** A value of 1 will start the variable frequency drive in the anticlockwise operating direction
	2	EN_Op	**Enable operation** 0: Stop (immediate disconnection of the output) 1: Operation If this bit has a value of 0, the variable frequency drive's output will be switched off directly. To start the device, this bit must be set to a value of 1 and the FWD or REV bit must be set to 1 as well
	3	FaultAck	**Fault Acknowledge** 0: Do not acknowledge current fault 1: Acknowledge current fault (rising edge: 0 ⟶ 1) This bit can be used to reset a fault in the variable frequency drive. The fault acknowledge function will only respond to a rising edge, i.e., to the value changing from 0 to 1.
	4	I4 (Input 1)	**Programmable input 1** Reserved – not used as of this writing
	5	I5 (Input 2)	**Programmable input 2** Reserved – not used as of this writing
	6	I6 (Input 3)	**Programmable input 3** Reserved – not used as of this writing
	7	I7 (Input 4)	**Programmable input 4** Reserved – not used as of this writing
1	0-7	--	Reserved – not used as of this writing

Profile 2 (2 x 16 bit): Inputs (Status)

Table 192. Profile 2: Input bytes 0 to 4

Byte	Bit	Designation	Meaning
0	0	--	Not used
	1	--	Not used
	2.3	A1, A2	**1-0-A-switch on DXG-NET-SWD**
			00 = Pos. A(utomatic)
			01 = Pos. 0 (off)
			10 = Pos. 0 (off)
			11 = Pos. 1 (on)
	4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm present
	5	--	Not used
	6	PRSNT	0: Device not present 1: Device present
	7	--	Not used

Table 192. Profile 2: Input bytes 0 to 4, continued

Byte	Bit	Designation	Meaning
1	0	RSO	**Ready For Switching On: S2** 0: Not ready for switching on 1: Ready for switching on If this bit has a value of 1, the variable frequency drive is ready to be switched on and has status 2.
	1	RDY	**Ready to operate; switched on: S3** 0: not ready for operation 1: ready for operation If this bit has a value of 1, the variable frequency drive is ready for operation and has status 3. This means that the device can be switched on immediately
	2	EN	**Enabled; operation: S4** 0: Stop 1: Operation If this bit has a value of 1, the variable frequency drive's power section (IGBTs) is active.
	3	ERR	**Error present** 0: no error 1: Error Indicates whether there is a variable frequency drive fault. If there is a fault, the variable frequency drive/variable speed starter will respond as configured in PNU **840.29953**
	4	C_Stop	**Free run-down, output de-energized (coast stop)** 0: no free run-down 1: free run-down If this bit has a value of 1, the variable frequency drive is coasting and the output is de-energized
	5	Q_Stop	**Quick stop, shortest ramp** 0: no quick stop 1: Quick stop If this bit has a value of 1, the variable frequency drive is stopping with the shortest ramp and the output is not de-energized.
	6	SOI	**Reclosing lockout (switching on inhibited: S1)** 0: No switch-on inhibit 1: Switch-on inhibit If this bit has a value of 1, the variable frequency drive is in reclosing lockout mode and cannot be started.
	7	WARN	**Warning present** 0: no warning 1: Warning Indicates whether there is a variable frequency drive warning.
2	8	f =f-Ref	**Operation at Setpoint** 0: Ref. frequency not reached 1. Ref. frequency reached As long as the slip compensation is lower than 5%, this parameter will have a value of 1. The bit's value will change to 0 for values higher than 5%.
	9	Ctl_Req	**Control requested to PLC** Is set if PNU 928.0 = 1 - 5. 0: Not ready for remote control 1, 2, 4, 5: Ready for remote control If the bit has a value of 1, the variable frequency drive can be controlled with the help of a PLC. If the bit has a value of 0, the variable frequency drive is not ready to be controlled by a PLC. The variable frequency drive may be in local or terminal control mode.
	10	f-Level	**Size comparison actual value - signaling threshold** 0: Actual speed is less than or equal to the signaling threshold 1: Actual speed is greater than the signaling threshold As soon as the actual speed is greater than the value set on relay output 1, the value will be set to 1. Otherwise, this bit will have a value of 0.
	11	Q11 (Output 1)	**Output Q1** Reserved – not used as of this writing
	12	Q12 (Output 2)	**Output Q2** Reserved – not used as of this writing
	13	Q13 (Output 3)	**Output Q3** Reserved – not used as of this writing
	14	Q14 (Output 4)	**Output Q4** Reserved – not used as of this writing
	15	--	Reserved – not used as of this writing
3, 4	0..15	ActSpeed	**Actual speed** Provides the current speed as an integer value between -200% and 200%. 100 % ≙ 4000hex

Profile 2 (2 x 16 bit): Outputs (Control)

Table 193. Profile 2: Output bytes 0 and 4

Byte	Bit	Designation	Meaning
0	0	OnOff	**On/Off** 0: Normal stop (with configured ramp time) 1: Operation This bit needs to be toggled once in order to start operation. This bit will not start or stop the device during normal operation
	1	Off2	**Run-down (Coast Stop: Off 2)** 0: Coast stop (switch off output voltage) 1: no free run-down If this bit has a value of 0, the variable frequency drive is coasting and the output is de-energized. If it has a value of 1, the variable frequency drive is running normally. This bit will not start or stop the device during normal operation.
	2	Off3	**Quick Stop: Off3** 0: Quick stop (shortest ramp) 1: no quick stop If this bit has a value of 0, the device will be stopped with a quick stop with the shortest ramp time. If it has a value of 1, the variable frequency drive is running normally. This bit will not start or stop the device during normal operation.
	3	EN_Op	**Operation released** 0: Stop 1: Operation If this bit has a value of 0, the variable frequency drive will stop. If it has a value of 1, the variable frequency drive's output will be enabled. This bit will start and stop the device during normal operation.
	4	EN_Ramp	**Release ramp (Enable Ramp Generator)** 0: Reset ramp (set point value = 0) 1: Release ramp If this bit has a value of 0, the variable frequency drive will remain stopped; the output will not be switched off. If it has a value of 1, the ramp enable signal will be activated and the device will start with the set ramp.
	5	Unfreeze	**Unfreeze ramp** 0: Freeze ramp (the ramp generator's current output value will be frozen) 1: Do not freeze ramp If this bit has a value of 0, the variable frequency drive will continue running with the most recently set frequency; the output will not be switched off. If this occurs after the ramp time elapses, this will have no effect until the next set point change. If the bit has a value of 1, the device will continue running along the set ramp all the way to the frequency set point.
	6	EN_Set	**Enable Setpoint** EN_Set enables the set point value and starts or stops the motor with the ramp function. 0: Do not activate set point value 1: activate set point value If this bit has a value of 0, the variable frequency drive will not receive a set point and will remain at the minimum frequency; the output will not be switched off. If it has a value of 1, the set point will be activated.
	7	FaultAck	**Fault Acknowledge** 0: Do not acknowledge current fault 1: Acknowledge current fault (rising edge: 0 –> 1) This bit can be used to reset a fault in the variable frequency drive. The fault acknowledge function will only respond to a rising edge, i.e., to the value changing from 0 to 1.

Table 193. Profile 2: Output bytes 0 and 4, continued

Byte	Bit	Designation	Meaning
1	8	Jog 1	Jog with set point value 1 If this bit and byte 1, bit 0 (OnOff) are set to 1 after byte 0, bit 2 (Ctl_PLC); byte 1, bit 1 (Off2); byte 1, bit 2 (Off3); and byte 1, bit 3 (EN_OP) have been set to 1,the variable frequency drive will start with fixed frequency 1 in the forward operating direction
	9	Jog 2	Reserved – not used as of this writing
	10	Ctl_PLC	PLC assumes control (Control by PLC) 0: no control via PLC 1: Control via PLC If this bit has a value of 1, the PLC will be able to control the variable frequency drive. Before this, the variable frequency drive will not carry out any commands it receives from the PLC. If the bit has a value of 0, the PLC will not be able to control the variable frequency drive.
	11	I11 (Input 1)	**Programmable input 1** Reserved – not used as of this writing
	12	I12 (Input 2)	**Programmable input 2** Reserved – not used as of this writing
	13	I13 (Input 3)	**Programmable input 3** Reserved – not used as of this writing
	14	I14 (Input 4)	Programmable input 4 Reserved – not used as of this writing
	15	ExtFault	**External Fault** If this bit is set, the variable frequency drive will stop with a selected PNU 840.29953 function. The behavior is the same as if there were a change from 1 –> 0 in the Enable signal, with the exception that the variable frequency drive will switch to the Error status. The external fault can be reset just like any other fault (with Fault acknowledge (bit 7) or by switching the supply voltage off and back on). 0: no external fault 1: external fault
2,3	0..15	Setpoint	**Setpoint as a percentage** The setpoint is specified as an integer value between -100 % and 100 %: 100% = 4000hex = 16384dec -100% = -4000hex = -16384dec

Table 194. References table for setpoint/actual speed

SN	N2 data type hex	N2 data type decimal	N2 data type percentage	Frequency in decimal
1	0x4000	16384	100	50
2	0x 3000	12288	74	37
3	0x 2000	8192	50	25
4	0x 1000	4096	24	12
5	0x 0000	0	0	0
6	0x F000	61440	–25	12
7	0x E000	57344	–50	25
8	0x D000	53248	–75	37
9	0x C000	49152	–100	50

SmartWire-DT diagnostics

The variable frequency drive supplies diagnostic messages for itself and for the DXG-NET-SWD… SmartWire-DT connection.

Basically, a distinction must be drawn between:

- Basic diagnostics (basic SmartWire-DT diagnostics)
- Advanced diagnostics (advanced SmartWire-DT diagnostics)
- PROFIdrive parameter channel diagnostics

PROFIdrive parameter channel diagnostics are shown with fault messages or warnings in the cyclic profile with PROFIdrive (profile 2).

Basic SWD Diagnostics

A pending diagnostic alarm from the variable frequency drive will be signaled as a collective diagnostic in the cyclic profile with input byte 0, bit 4 (DIAG). A device response, if any, will be described in the advanced diagnostics.

In addition, in all profiles, the following bits

- ERR (the variable frequency drive stops) or
- WARN (no reaction of the variable frequency drive)

in the corresponding input bytes are used to show whether there are any diagnostic alarms (i.e. errors or warnings).

Advanced SmartWire-DT diagnostics

When there is a collective diagnostic (input byte 0, bit 4 (DIAG)), the variable frequency drive will provide advanced diagnostic messages.

The following messages are generated by the variable frequency drive

After the cause of the fault is fixed, you can acknowledge a fault (ERR) as follows:

- Profile: FaultAck = 1,
- 1-0-A switch in position 0.

Warnings (WARN) cannot be acknowledged, since they are simply messages without an ensuing response (the variable frequency drives).

The diagnostic data that corresponds to the PROFIdrive profile can be sent at any time regardless of the profile chosen. It is provided via the acyclic services of the relevant bus system

Note: For available diagnostic alarms FaultBuffer: PNU 947 sub-index 0 to 7

Table 195. Diagnostic alarms of the PowerXL DG1 variable frequency drive

Value [hex]	Meaning	Remedy	Notes
0x14	No communications between the PowerXL DG1 communication module and the PowerXL DG1 Inverter or internal error in the communication module (Board Fault)	If the error continues, switch the supply voltage off/on • Check EMC • Replace the variable frequency drive	
0x19	There is a warning from the PowerXL DG1 Inverter	Read warning PNU 882.0 and fix the cause	Corresponds to the WARN bit in the corresponding input byte
0x1A	There is a PowerXL DG1 Inverter error	Read fault PNU 944 to PNU 952 • Fix the fault and acknowledge the fault message	Corresponds to the ERR bit in the corresponding input byte

BACnet/IP On-Board Communication— PowerXL DH1

BACnet stands for Building Automation and Control Networks. It is the common name for the communication standard ISO 16484-5 that defines the methods and the protocol for cooperating building automation devices to communicate. Devices can be designed to operate using BACnet communication protocol as well as utilizing BACnet protocol to communicate between systems. BACnet is an internationally accepted protocol for building automation (such as lightning control, air conditioning, and heating automation) and control over a communications network. BACnet provides a method by which computer-based control equipment, from different manufacturers can work together, or "interoperate." For this to be achieved, components must be able to exchange and understand BACnet data messages. Your drive is equipped with BACnet support as standard

BACnet/IP specifications

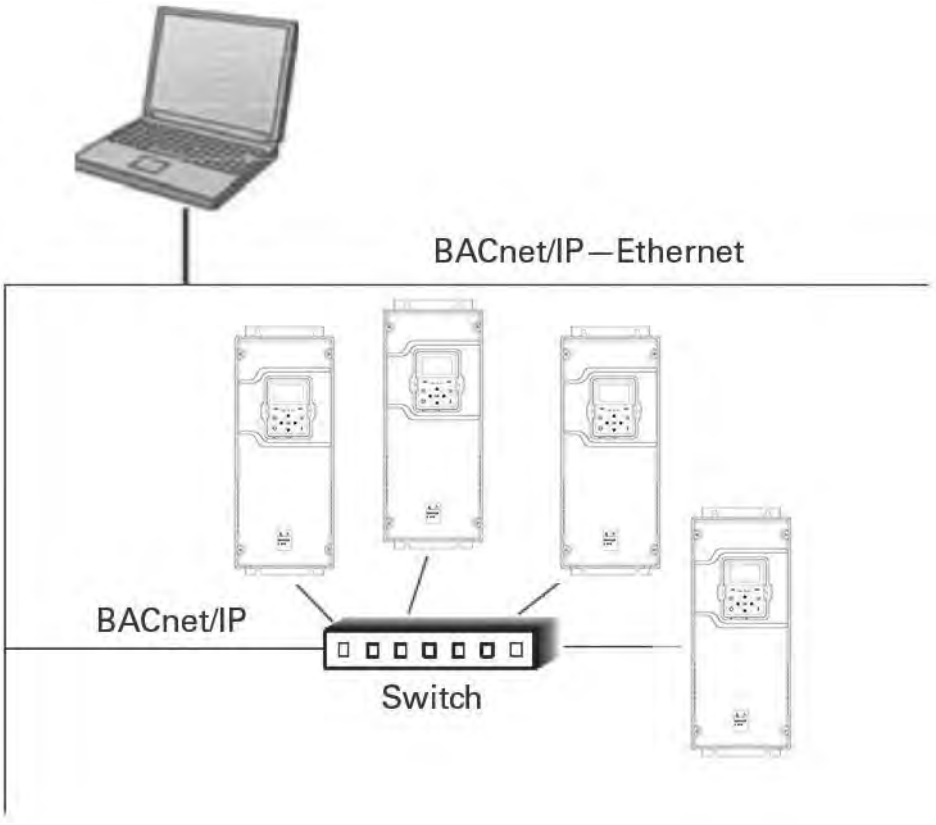
Table 196. BACnet/IP Protocol

Connection	Communication
Interface	100BaseTX, IEEE 802.3 compatible
Data transfer method	Ethernet half-/full-duplex
Data transfer speed	10/100 MBit/s, autosensing
Protocol	BACnet over UDP/IP
Connector	Shielded RJ45 connector
Cable type	CAT5e STP
BACnet/IP	As described in ANSI/ASHRAE Standards 135-2004
Default/IP	Selectable: Fixed or DHCP

BACnet/IP connections

The control board is located inside the control unit of the drive.

Figure 69. Principle example diagram of BACnet



Prepare to use BACnet/IP through RJ45 port

1. Open the cover of the AC drive.

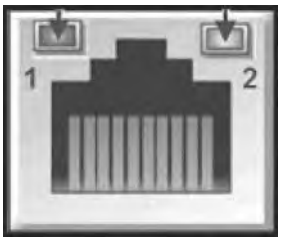
⚠ WARNING

The relay outputs and other I/O-terminals may have a dangerous control voltage present even when drive is disconnected from mains.

2. Connect Ethernet cable.
3. Remount the AC drive cover.

Note: When planning the cable runs, remember to keep the distance between the fieldbus cable and the motor cable at a minimum of 11.81 in (30 cm).

RJ45 port LED indications



RJ45 LED

1. Ethernet Link Status
2. Ethernet Link Speed

Commissioning

Connections and wiring

The RJ45 port supports 10/100 Mb speeds in both full and half-duplex modes. The boards must be connected to the RJ45 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 drive 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 70. CAT-5e cable

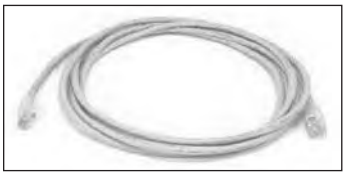
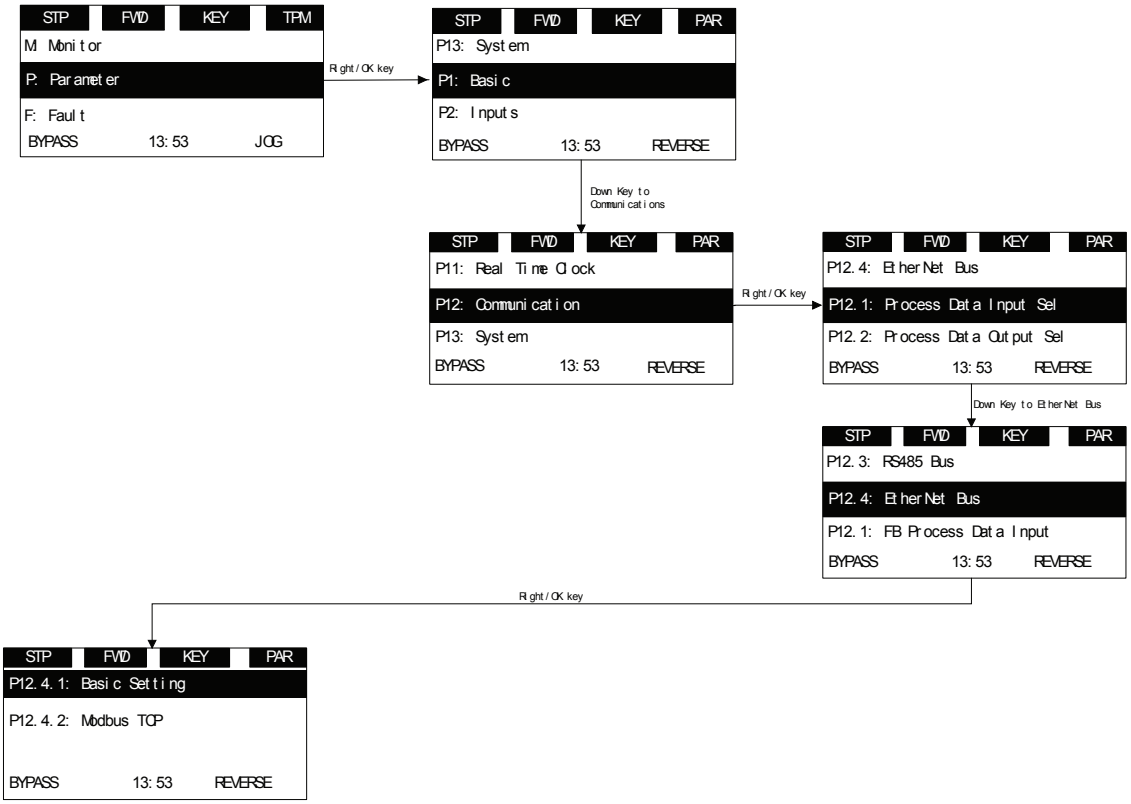


Figure 71. DH1 keypad navigation to ethernet comm settings



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

Table 197. EtherNet/IP

DH1 code	Parameter	Min.	Max.	Unit	Default	ID	Note
P12.4.1.1	IP Address Mode				1	1500	0 = Static IP 1 = DHCP with AutoIP
P12.4.1.2	Active IP Address					1507	
P12.4.1.3	Active Subnet Mask					1509	
P12.4.1.4	Active Default Gateway					1511	
P12.4.1.5	MAC Address					1513	
P12.4.1.6	Static IP Address				192.168.1.254	1501	
P12.4.1.7	Static Subnet Mask				255.255.255.0	1503	
P12.4.1.8	Static Default Gateway				192.168.1.1	1505	
P12.4.1.9	Enable BACnet IP	0	1		0	1725	0 = Disable 1 = Enable

Note: BACnet/IP uses parameters from EtherNet/IP.

DHCP

The BACnet/IP network 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 device 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 RJ45 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 BACnet/IP 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 BACnet/IP 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.

Enable BACnet/IP

The enable BACnet/IP will enable the BACnet/IP ability and disable the BACnet MSTP protocol function.

Manual IP address configuration

Using the PowerXL DH1 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.

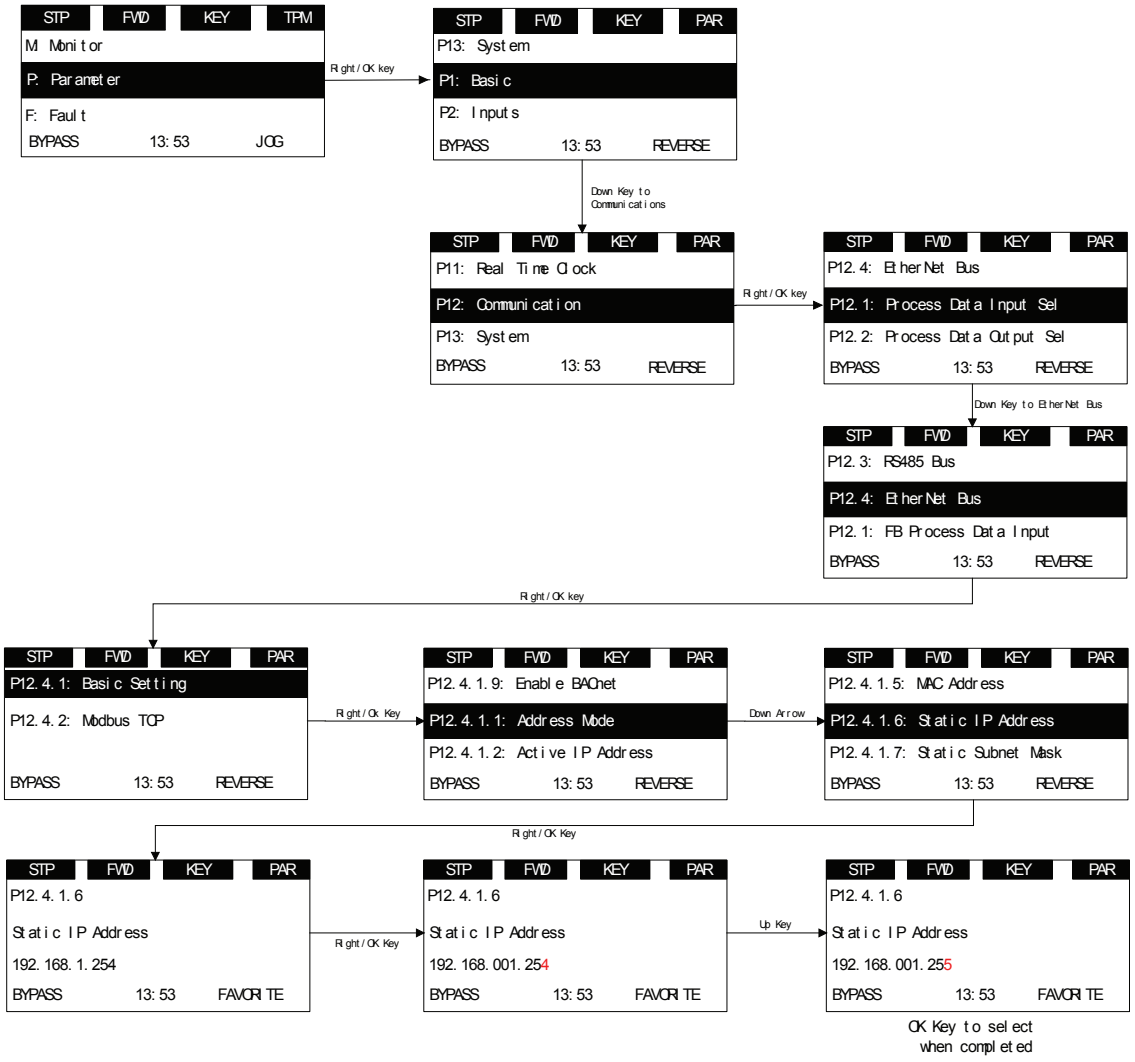
Note: Change in IP address mode will require drive to power cycle to get this change effective. Also ensure device MAC address.

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

   a. Setting Static IP Address
   b. Setting Static Subnet Mask
   c. Setting Static Default Gateway

Figure 72. DH1 Static IP mode

Figure 73. DH1 Static IP address



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.

Table 198. BACnet/IP

DH1 code	Parameter	Min.	Max.	Unit	Default	ID	Note
P12.4	EtherNet Bus						
P12.4.1	Basic Setting						
P12.4.1.1	IP Address Mode				1	1500	0 = Static IP 1 = DHCP with AutoIP
P12.4.1.2	Active IP Address					1507	
P12.4.1.3	Active Subnet Mask					1509	
P12.4.1.4	Active Default Gateway					1511	
P12.4.1.5	MAC Address					1513	
P12.4.1.6	Static IP Address				192.168.1.254	1501	
P12.4.1.7	Static Subnet Mask				255.255.255.0	1503	
P12.4.1.8	Static Default Gateway				192.168.1.1	1505	
P12.4.1.9	Enable BACnetIP	0	1		0	1725	0 = Disabled 1 = Enabled
P12.4.3	BACnet IP						
P12.4.3.1	BACnet IP UDP port number	47808	47823		47808	1733	47808 = BAC0, 47809 = BAC1, 47810 = BAC2, 47811 = BAC3, 47812 = BAC4, 47813 = BAC5, 47814 = BAC6, 47815 = BAC7, 47816 = BAC8, 47817 = BAC9, 47818 = BACA, 47819 = BACB, 47820 = BACC, 47821 = BACD, 47822 = BACE, 47823 = BACF
P12.4.3.2	BACnet IP Foreign Device	0	1		0	1734	0 = Disabled 1 = Enabled
P12.4.3.3	BACnet IP BBMD IP				0.0.0.0	1735	
P12.4.3.4	BACnet IP BBMD Port	47808	47823		47808	1737	47808 = BAC0, 47809 = BAC1, 47810 = BAC2, 47811 = BAC3, 47812 = BAC4, 47813 = BAC5, 47814 = BAC6, 47815 = BAC7, 47816 = BAC8, 47817 = BAC9, 47818 = BACA, 47819 = BACB, 47820 = BACC, 47821 = BACD, 47822 = BACE, 47823 = BACF
P12.4.3.5	BACnet IP Registration Interval	0	65535	Sec	10	1738	
P12.4.3.6	BACnet IP Comm Timeout	0	60000	Sec	0	1739	
P12.4.3.7	BACnet IP Protocol Status				0	1740	0 = Stopped, 1 = Operational, 2 = Faulted
P12.4.3.8	BACnet IP Fault Behavior	0	1		0	1741	0 = In Fieldbus Control 1 = in all Control
P12.4.3.9	BACnetIP Instance Number	0	4194302		0	1742	

BACnet/IP parameters

Table 199. BACnet/IP parameter descriptions

ID	Name	Description
P12.4.1.9	Enable BACnet/IP	This parameter enables BACnet IP communications. When this parameter is enabled, other parameters in menu becomes visible, else they are hidden.
P12.4.3.1	BACnet/IP UDP port number	The UDP port for the BACnet IP communication.
P12.4.3.2	BACnet/IP Foreign Device	The foreign device feature is used when the device is located in a different network than the BBMD. A normal router does not send broadcast messages between different networks. The 'Foreign device' feature solves this problem by establishing a connection to the BBMD with unicast messages. All broadcast messages are forwarded to a BBMD device that takes care of receiving and transmitting broadcast messages in both directions for all foreign devices.
P12.4.3.3	BACnet/IP BBMD IP	The IP address of the BACnet IP Broadcast Management Device.
P12.4.3.4	BACnet/IP BBMD Port	The BBMD Port number.
P12.4.3.5	BACnet/IP Registration Interval	The registration interval to keep a live connection to the BBMD. Unit is seconds.
P12.4.3.6	BACnet/IP Comm Timeout	Defines the number of seconds after a timeout is indicated after a communication break or disconnected EtherNet link. Value 0 disables communication link supervision.
P12.4.3.7	BACnet/IP Protocol Status	Fieldbus Protocol Status tells the status of the protocol.
P12.4.3.8	BACnet/IP Fault Behavior	Defines when Fieldbus fault to be raise if fault condition is detected.
P12.4.3.9	BACnet/IP Instance Number	The Device Object's Instance number is used in conjunction with the MAC address to assign the devices on the network. The instance number can have up to 127 nodes on it before a different instance number is required.

BACnet overview

BACnet technical data

Protocol Implementation Conformance Statement (PICS)

Controller Profile

- B—ASC

Segmentation Capability

- Not supported

Data Link Layer and Routing Options

- 10/100 MBit/s, Autosensing

Character Sets Supported

- UTF8

BIBBS Supported

- Data Sharing
  - ReadProperty—B
  - WriteProperty—B
- Device Management
  - Dynamic Device Binding—B
  - Dynamic Object Binding—B
  - DeviceCommunicationControl—B
  - ReinitializeDevice—B
- Alarms and Events: Not supported
- Schedules: Not supported
- Trends: Not supported
- Network Management: Not supported

Table 200. Supported object types and properties summary

Property	Device object type	Analog input object type	Analog value object type	Binary value object type	Multiple state value object type
Acked_Transitions					
Active_Cov_Subscriptions					
Active_Text				■	
Active_Vt_Sessions					
Alarm_Value					
Alarm_Values					
Align_Intervals					
Apdu_Segment_Timeout					
Apdu_Timeout	■				
Application_Software_Version	■				
Auto_Slave_Discovery					
Backup_And_Restore_State					
Backup_Failure_Timeout					
Backup_Preparation_Time					
Change_Of_State_Count					
Change_Of_State_Time					
Configuration_Files					
Cov_Increment					
Database_Revision	■				
Daylight_Savings_Status					
Deadband					
Description	■	■	■	■	■
Device_Address_Binding	■				
Device_Type					
Elapsed_Active_Time					
Event_Algorithm_Inhibit					
Event_Algorithm_Inhibit_Ref					
Event_Detection_Enable					
Event_Enable					
Event_Message_Texts					
Event_Message_Texts_Config					
Event_State		■	■	■	■
Event_Time_Stamps					
Fault_Values					
Firmware_Revision	■				
High_Limit					
Inactive_Text				■	
Interval_Offset					
Last_Restart_Reason					
Last_Restore_Time					
Limit_Enable					
Local_Date					
Local_Time					
Location					
Low_Limit					
Manual_Slave_Address_Binding					
Max_Apdu_Length_Accepted	■				
Max_Pres_Value					
Max_Segments_Accepted					

Table 200. Supported object types and properties summary, continued

Property	Device object type	Analog input object type	Analog value object type	Binary value object type	Multiple state value object type
Min_Pres_Value					
Minimum_Off_Time					
Minimum_On_Time					
Model_Name	■				
Notification_Class					
Notify_Type					
Number_Of_Apdu_Retries	■				
Number_Of_States					■
Object_Identifier	■	■	■	■	■
Object_List	■				
Object_Name	■	■	■	■	■
Object_Type	■	■	■	■	■
Out_Of_Service		■	■	■	■
Password	■				
Present_Value		■	■	■	■
Priority_array			■	■	
Profile_Name	■				
Protocol_Object_Types_supported	■				
Protocol_Revision	■				
Protocol_Services_Supported	■				
Protocol_Version	■				
Reliability					
Reliability_Evaluation_Inhibit					
Relinquish_Default			■	■	
Resolution					
Restart_Notification_Recipients					
Restore_Completion_Time					
Restore_Preparation_Time					
Segmentation_Supported	■				
Serial_Number	■				
Slave_Address_Binding					
Slave_Proxy_Enable					
State_Text					■
Status_Flags		■	■	■	■
Structured_Object_list					
System_Status	■				
Time_Delay					
Time_Delay_Normal					
Time_Of_Active_Time-reset					
Time_Of_Device_Restart					
Time_Of_State_Count_Reset					
Time_Synchronization_Interval					
Time_Synchronization_Recipients					
Units		■	■		
Update_Interval					
Utc_Offset					
Utc_Time_Synchronization_Recipients					
Vendor_Identifier	■				
Vendor_Name	■				
Vt_Classes_Supported					

Object instance summary

Binary Value Object Instance Summary

The following table summarizes the Binary Value Objects supported.

Table 201. Binary value object instance summary

Instance ID	Object name (related to drive parameter)	Description	Inactive/ active text	Preset value access
BV0	Ready State	Indicates whether the drive is ready or not	Not Ready/Ready	R
BV1	Run/Stop State	Indicates whether the drive is running or stopped	Stop/Run	R
BV2	Fwd/Rev State	Indicates the rotation direction of motor	Fwd/Rev	R
BV3	Fault State	Indicates if a fault is active	OK/Fault	R
BV4	Warning State	Indicates if a warning is active	OK/Warning	R
BV5	At Setpoint	Ref. Frequency reached	False/True	R
BV6	At Zero Speed	Motor Running at zero speed	False/True	R
BV7	Motor Ctrl source	Command to change active source for controlling motor	LocalMotorCtrl / FBMotorCtrl	C
BV8	Speed Reference Source	Command to change source of motor speed reference	LocalSpeedRef / FBSpeedRef	C
BV9	Run/Stop CMD	Command to start drive	Stop/Run	C
BV10	Fwd/Rev CMD	Command to change rotational direction	Fwd/Rev	C
BV11	Reset Fault	Command to reset active Fault from drive	0/Reset	C
BV12	Digital Input 1	Digital Input 1	OFF/ON	R
BV13	Digital Input 2	Digital Input 2	OFF/ON	R
BV14	Digital Input 3	Digital Input 3	OFF/ON	R
BV15	Digital Input 4	Digital Input 4	OFF/ON	R
BV16	Digital Input 5	Digital Input 5	OFF/ON	R
BV17	Digital Input 6	Digital Input 6	OFF/ON	R
BV18	Digital Input 7	Digital Input 7	OFF/ON	R
BV19	Digital Input 8	Digital Input 8	OFF/ON	R
BV20	Digital Output 1	Digital Output 1	OFF/ON	R
BV21	Digital Output 2	Relay 1 Output	OFF/ON	R
BV22	Digital Output 3	Relay 2 Output	OFF/ON	R
BV23	Digital Output 4	Relay 3 Output	OFF/ON	R
BV24	Stop By Coast	Indicates if drive stop by coast	ON/OFF	C
BV25	Stop By Ramp	Indicates if drive stop by Ramp	OFF/ON	C
BV26	Belt Broken	Indicates If belt is broken	OFF/ON	R
BV27	Drive Fan Failure	Indicates if Drive Fan failed	OFF/ON	R
BV28	Force Bypass	Command to take Drive in Bypass Mode	OFF/ON	C
BV29	Fire Mode	Enable Fire Mode	OFF/ON	C
BV30	DIN 1	Fieldbus Digital Input	OFF/ON	C
BV31	DIN 2	Fieldbus Digital Input	OFF/ON	C
BV32	DIN 3	Fieldbus Digital Input	OFF/ON	C
BV33	DIN 4	Fieldbus Digital Input	OFF/ON	C

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable.

Commandable values support priority arrays and relinquish defaults.

Analog value object instance summary

The following table summarizes the Analog Value Objects supported.

Table 202. Analog value object instance summary

Instance ID	Object name	Description	Units	Preset value access
AV0	Speed Reference	Motor speed reference from network	Percent	C
AV1	Current Limit	Current Limit	Amps	W
AV2	Min Frequency	Minimum Frequency	Hz	W
AV3	Maximum Frequency	Maximum Frequency	Hz	W
AV4	Accel Time 1	Acceleration Time	seconds	W
AV5	Decel Time 1	Deceleration Time	seconds	W
AV6	AnyParam ID	Parameter ID number to be accessed	No Units	W
AV7	AnyParam Value	Value of parameter defined by AV6	No Units	W
AV8	Process Data In 1	Fieldbus Process Data In 1	N/A	C
AV9	Process Data In 2	Fieldbus Process Data In 2	N/A	C
AV10	Process Data In 3	Fieldbus Process Data In 3	N/A	C
AV11	Process Data In 4	Fieldbus Process Data In 4	N/A	C
AV12	Process Data In 5	Fieldbus Process Data In 5	N/A	C
AV13	Process Data In 6	Fieldbus Process Data In 6	N/A	C
AV14	Process Data In 7	Fieldbus Process Data In 7	N/A	C
AV15	Process Data In 8	Fieldbus Process Data In 8	N/A	C

Note: For Present Value Access Types, W = Writeable, C = Commandable.

Commandable values support priority arrays and relinquish defaults.

Analog input object instance summary

The following table summarizes the Analog Input Objects supported.

Table 203. Analog input object instance summary

Instance ID	Object name	Description	Units	Preset value access
AI0	Frequency Setpoint	Frequency Setpoint	Hz	R
AI1	Output Frequency	Output Frequency	Hz	R
AI2	Motor Speed	Motor Speed	Rpm	R
AI3	Motor Load	Motor Load	Percent	R
AI4	Kilowatt Hours total	Kilowatt Hour Counter (Total) scaled by 1000	KWh	R
AI5	Motor Current	Motor Current	Amps	R
AI6	DC link Voltage	DC link Voltage	Volts	R
AI7	Motor Voltage	Motor Voltage	Volts	R
AI8	Unit Temperature	Heatsink Temperature	°C	R
AI9	Motor Torque	In % of motor nominal Torque	Percent	R
AI10	Operating Days	Operating Days (resettable)	Day	R
AI11	Operating Hours	Operating Hours (resettable)	Hour	R
AI12	Motor Temperature	Motor Temperature	Percent	R
AI13	Analog Input 1	Analog Input 1	Volts	R
AI14	Analog Input 2	Analog Input 2	Volts	R
AI15	Analog Output 1	Analog Output 1	Volts	R
AI16	Analog Output 2	Analog Output 2	Volts	R
AI17	Kilowatt Instantaneous	Kilowatt Instantaneous	kW	R
AI18	Process Data Out 1	Fieldbus Process Data Out 1	N/A	R
AI19	Process Data Out 2	Fieldbus Process Data Out 2	N/A	R
AI20	Process Data Out 3	Fieldbus Process Data Out 3	N/A	R
AI21	Process Data Out 4	Fieldbus Process Data Out 4	N/A	R
AI22	Process Data Out 5	Fieldbus Process Data Out 5	N/A	R
AI23	Process Data Out 6	Fieldbus Process Data Out 6	N/A	R
AI24	Process Data Out 7	Fieldbus Process Data Out 7	N/A	R
AI25	Process Data Out 8	Fieldbus Process Data Out 8	N/A	R

Note: For Present Value Access Types, R = Read-only.

Commandable values support priority arrays and relinquish defaults.

Multi state object instance summary

The following table summarizes the Multi State Objects supported.

Table 204. Multi state object instance summary

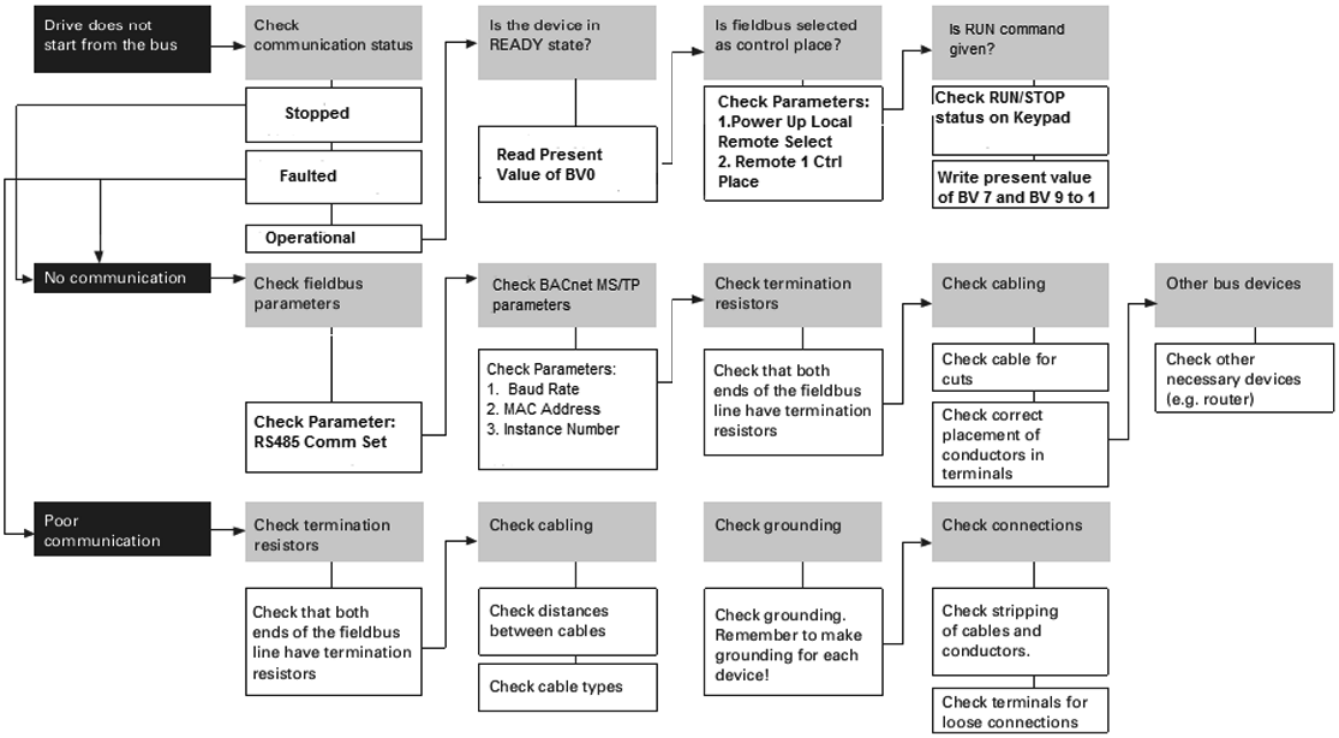
Instance ID	Object name	Description	State text	Preset value access
MV0	Control Mode	Indicates the Drive Control Mode - Local, Remote or OFF	0 = Local(Hand) / 1 = Remote / 2 = OFF	R
MV1	Active Fault Code	Indicates the Latest Active Fault Code of the Drive	State Text w.r.t the Active Fault Code	R

Note: For Present Value Access Types, R = Read-only.

Commandable values support priority arrays and relinquish defaults.

Fault tracing

Figure 74. Fault tracing



Appendix A—Parameter ID list

Parameter descriptions

Notes

① These parameters are active in the DG1 FR7 and FR8 units only.
② These parameters are not active in the DG1 FR7 and FR8 units only.

Table 205. DG1 Parameter ID list

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
M1	1	502	0	160	1	1	160	1	1	Output Frequency	INTEGER	2	x100
M2	24	1	0	160	1	2	160	1	2	Freq Reference	INTEGER	2	x100
M3	2	503	0	4	70	3	4	70	3	Motor Speed	INTEGER	2	x0
M4	3	504	0	160	1	4	160	1	4	Motor Current	INTEGER	2	x10
M5	4	507	0	160	1	5	160	1	5	Motor Torque	INTEGER	2	x10
M6	5	513	1	160	1	6	160	1	6	Motor Power	INTEGER	2	x10
M7	6	501	0	160	1	7	160	1	7	Motor Voltage	INTEGER	2	x10
M8	7	501	1	160	1	8	160	1	8	DC-link Voltage	INTEGER	2	x0
M9	8	822	6	160	1	9	160	1	9	Unit Temperature	INTEGER	2	x10
M10	9	822	4	160	1	10	160	1	10	Motor Temperature	INTEGER	2	x10
M11	15	2	1	160	1	11	160	1	11	Torque Reference	INTEGER	2	x10
M12	10	560	0	160	1	12	160	1	12	Analog Input 1	INTEGER	2	x100
M13	11	560	1	160	1	13	160	1	13	Analog Input 2	INTEGER	2	x100
M14	25	570	0	4	75	3	4	75	3	Analog Output 1	INTEGER	2	x100
M15	575	570	1	160	1	15	160	1	15	Analog Output 2	INTEGER	2	x100
M16	12	760	0	160	1	16	160	1	16	DI1, DI2, DI3	BYTE	1	x0
M17	13	760	1	160	1	17	160	1	17	DI4, DI5, DI6	BYTE	1	x0
M18	576	760	2	160	1	18	160	1	18	DI7, DI8	BYTE	1	x0
M19	14	754	0	160	1	19	160	1	19	DO1,Virtual RO1,Virtual RO2	BYTE	1	x0
M20	557	762	0	160	1	20	160	1	20	RO1, RO2, RO3	BYTE	1	x0
M21	558	763	0	160	1	22	160	1	21	TC1, TC2, TC3	BYTE	1	x0
M22	559	3125	0	160	1	23	160	1	22	Interval 1	BOOLEAN	1	x0
M23	560	3125	1	160	1	24	160	1	23	Interval 2	BOOLEAN	1	x0
M24	561	3125	2	160	1	25	160	1	24	Interval 3	BOOLEAN	1	x0
M25	562	3125	3	160	1	26	160	1	25	Interval 4	BOOLEAN	1	x0
M26	563	3125	4	160	1	27	160	1	26	Interval 5	BOOLEAN	1	x0
M27	569	3101	0	160	1	28	160	1	27	Timer 1	DOUBLE	4	x0
M28	571	3101	1	160	1	29	160	1	28	Timer 2	DOUBLE	4	x0
M29	573	3101	2	160	1	30	160	1	29	Timer 3	DOUBLE	4	x0
M30	16	2150	0	160	1	31	160	1	30	PID1 Set Point	DOUBLE	4	x100
M31	18	2864	0	160	1	32	160	1	31	PID1 Feedback	DOUBLE	4	x100
M32	20	2167	0	160	1	33	160	1	32	PID1 Error Value	DOUBLE	4	x100
M33	22	2124	0	160	1	34	160	1	33	PID1 Output	INTEGER	2	x100
M34	23	2133	0	160	1	35	160	1	34	PID1 Status	BYTE	1	x0
M35	32	2150	1	160	1	36	160	1	35	PID2 Set Point	DOUBLE	4	x100
M36	34	2864	1	160	1	37	160	1	36	PID2 Feedback	DOUBLE	4	x100
M37	36	2167	1	160	1	38	160	1	37	PID2 Error Value	DOUBLE	4	x100
M38	38	2124	1	160	1	39	160	1	38	PID2 Output	INTEGER	2	x100
M39	39	2133	1	160	1	40	160	1	39	PID2 Status	BYTE	1	x0
M40	26	1911	0	160	1	41	NA	NA	NA	Running Motors	BYTE	1	x0
M41	27	580	0	160	1	42	160	1	41	PT100 Temperture	INTEGER	2	x10
M42	28	NA	NA	160	1	44	160	1	42	Latest Fault Code	BYTE	1	x0
M43	583	790	0	162	1	11	160	1	43	RTC Battery Status	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
M44	1686	NA	NA	164	1	57	160	1	44	Instant Motor Power	DOUBLE	4	x1000
M45	2120	NA	NA	164	1	77	160	1	45	Energy Savings	DOUBLE	4	x1000
M46	2209	NA	NA	NA	NA	NA	NA	NA	NA	Control Board DIDO Status	INTEGER	2	x0
M47	2210	NA	NA	NA	NA	NA	NA	NA	NA	SlotA DIDO Status	INTEGER	2	x0
M48	2211	NA	NA	NA	NA	NA	NA	NA	NA	SlotB DIDO Status	INTEGER	2	x0
M49	29	NA	NA	160	1	43	NA	NA	NA	Application Status Word	INTEGER	2	x0
M50	2414	NA	NA	NA	NA	NA	NA	NA	NA	Standard Status Word	INTEGER	2	x0
M51	2445	NA	NA	NA	NA	NA	NA	NA	NA	Output	DOUBLE	4	x100
M52	2447	NA	NA	NA	NA	NA	NA	NA	NA	Reference	DOUBLE	4	x100
M53	601	520	2	162	1	13	185	1	3	Total MWh Count	DOUBLE	4	x10000
M54	603	522	0	162	1	14	185	1	4	Total Power Day Count	INTEGER	2	x0
M55	606	821	1	162	1	15	185	1	5	Total Power Hr Count	DOUBLE	4	x0
M56	604	806	0	162	1	16	185	1	6	Trip MWh Count	DOUBLE	4	x10000
M57	636	870	0	162	1	18	185	1	8	Trip Power Day Count	INTEGER	2	x0
M58	637	871	0	162	1	19	185	1	9	Trip Power Hr Count	DOUBLE	4	x0
M59	30	329	0	160	1	45	160	1	46	Multi-Monitoring	BYTE	3	x0
P1.1	101	20	0	160	1	162	162	1	1	Min Frequency	INTEGER	2	x100
P1.2	102	20	1	160	1	163	162	1	2	Max Frequency	INTEGER	2	x100
P1.3	103	130	0	160	1	164	162	1	3	Accel Time 1	INTEGER	2	x10
P1.4	104	134	0	160	1	165	162	1	4	Decel Time 1	INTEGER	2	x10
P1.5	486	210	0	40	2	6	40	2	6	Motor Nom Current	INTEGER	2	x10
P1.6	489	217	0	40	2	15	40	2	15	Motor Nom Speed	INTEGER	2	x0
P1.7	490	215	0	161	1	116	162	1	7	Motor PF	INTEGER	2	x100
P1.8	487	211	0	40	2	7	40	2	7	Motor Nom Voltage	INTEGER	2	x0
P1.9	488	216	0	161	1	118	162	1	9	Motor Nom Frequency	INTEGER	2	x100
P1.10	1685	NA	NA	164	1	56	162	1	10	Power Up Local Remote Select	BYTE	1	x0
P1.11	135	408	0	160	1	150	162	1	11	Remote 1 Control Place	BYTE	1	x0
P1.12	1695	NA	NA	164	1	63	162	1	12	Local Control Place	BYTE	1	x0
P1.13	2462	NA	NA	NA	NA	NA	NA	NA	NA	Bumpless Enable	BYTE	1	x0
P1.14	136	436	0	160	1	152	162	1	13	Local Reference	BYTE	1	x0
P1.15	137	437	0	160	1	153	162	1	14	Remote 1 Reference	BYTE	1	x0
P1.16	1679	622	3	164	1	53	162	1	15	Reverse Enable	BYTE	1	x0
P1.17	2423	NA	NA	NA	NA	NA	NA	NA	NA	Run Delay Time	INTEGER	2	x0
P1.18	2465	NA	NA	NA	NA	NA	NA	NA	NA	HOA Source	BYTE	1	x0
P2.1.1	144	35	1	160	1	50	163	1	21	AI Ref Scale Min Value	INTEGER	2	x100
P2.1.2	145	34	1	160	1	51	163	1	22	AI Ref Scale Max Value	INTEGER	2	x100
P2.2.1	222	263	0	160	1	52	163	1	1	AI1 Mode	BYTE	1	x0
P2.2.2	175	260	0	160	1	54	163	1	2	AI1 Signal Range	BYTE	1	x0
P2.2.3	176	264	0	160	1	55	163	1	3	AI1 Custom Min	INTEGER	2	x100
P2.2.4	177	265	0	160	1	56	163	1	4	AI1 Custom Max	INTEGER	2	x100
P2.2.5	174	266	0	160	1	57	163	1	5	AI1 Filter Time	INTEGER	2	x100
P2.2.6	181	267	0	160	1	62	163	1	6	AI1 Signal Invert	BOOLEAN	1	x0
P2.2.7	178	1711	0	160	1	63	163	1	7	AI1 Joystick Hyst	INTEGER	2	x100

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
P2.2.8	179	1720	0	160	1	64	163	1	8	AI1 Sleep Limit	INTEGER	2	x100
P2.2.9	180	1721	0	160	1	65	163	1	9	AI1 Sleep Delay	INTEGER	2	x100
P2.2.10	133	1712	0	160	1	66	163	1	10	AI1 Joystick Offset	INTEGER	2	x100
P2.3.1	223	263	1	160	1	53	163	1	11	AI2 Mode	BYTE	1	x0
P2.3.2	183	260	1	160	1	58	163	1	12	AI2 Signal Range	BYTE	1	x0
P2.3.3	184	264	1	160	1	59	163	1	13	AI2 Custom Min	INTEGER	2	x100
P2.3.4	185	265	1	160	1	60	163	1	14	AI2 Custom Max	INTEGER	2	x100
P2.3.5	182	266	1	160	1	61	163	1	15	AI2 Filter Time	INTEGER	2	x100
P2.3.6	189	267	1	160	1	67	163	1	16	AI2 Signal Invert	BOOLEAN	1	x0
P2.3.7	186	1711	1	160	1	68	163	1	17	AI2 Joystick Hyst	INTEGER	2	x100
P2.3.8	187	1720	1	160	1	69	163	1	18	AI2 Sleep Limit	INTEGER	2	x100
P2.3.9	188	1721	1	160	1	70	163	1	19	AI2 Sleep Delay	INTEGER	2	x100
P2.3.10	134	1712	1	160	1	71	163	1	20	AI2 Joystick Offset	INTEGER	2	x100
P2.4.1	2484	NA	NA	NA	NA	NA	NA	NA	NA	Fine Tuning Input	BYTE	1	x0
P2.4.2	2485	NA	NA	NA	NA	NA	NA	NA	NA	Fine Tuning Min	INTEGER	2	x10
P2.4.3	2486	NA	NA	NA	NA	NA	NA	NA	NA	Fine Tuning Max	INTEGER	2	x10
P3.1	143	425	0	160	1	169	164	1	1	IO Terminal 1 Start Stop Logic	BYTE	1	x0
P3.2	190	414	0	160	1	72	164	1	2	IO Terminal 1 Start Signal 1	BYTE	1	x0
P3.3	191	414	1	160	1	73	164	1	3	IO Terminal 1 Start Signal 2	BYTE	1	x0
P3.4	881	409	0	160	1	200	164	1	4	Thermistor Input Select	BYTE	1	x0
P3.5	198	421	2	160	1	74	164	1	5	Reverse	BYTE	1	x0
P3.6	192	446	0	160	1	75	164	1	6	Ext. Fault 1 NO	BYTE	1	x0
P3.7	193	447	0	160	1	76	164	1	7	Ext. Fault 1 NC	BYTE	1	x0
P3.8	200	400	7	160	1	77	164	1	8	Fault Reset	BYTE	1	x0
P3.9	194	400	16	160	1	78	164	1	9	Run Enable	BYTE	1	x0
P3.10	205	432	0	160	1	79	164	1	10	Preset Speed B0	BYTE	1	x0
P3.11	206	432	1	160	1	80	164	1	11	Preset Speed B1	BYTE	1	x0
P3.12	207	432	2	160	1	81	164	1	12	Preset Speed B2	BYTE	1	x0
P3.13	550	2134	0	160	1	82	164	1	13	PID1 Control Enable	BYTE	1	x0
P3.14	553	2134	1	160	1	83	164	1	14	PID2 Control Enable	BYTE	1	x0
P3.15	195	435	0	160	1	84	164	1	15	Accel/Decel Time Set	BYTE	1	x0
P3.16	201	400	5	160	1	85	164	1	16	Accel/Decel Prohibit	BYTE	1	x0
P3.17	215	402	5	160	1	86	164	1	17	No Access To Param	BYTE	1	x0
P3.18	203	421	4	160	1	87	164	1	18	Accel Pot Value	BYTE	1	x0
P3.19	204	421	5	160	1	88	164	1	19	Decel Pot Value	BYTE	1	x0
P3.20	216	405	0	160	1	89	164	1	20	Reset Pot Zero	BYTE	1	x0
P3.21	196	406	0	160	1	90	164	1	21	Remote Control	BYTE	1	x0
P3.22	197	406	1	160	1	91	164	1	22	Local Control	BYTE	1	x0
P3.23	209	407	0	160	1	92	164	1	23	Remote 1/2 Select	BYTE	1	x0
P3.24	217	417	0	160	1	93	164	1	24	Second Motor Para Select	BYTE	1	x0
P3.25	218	NA	NA	160	1	94	164	1	25	Bypass Start	BYTE	1	x0
P3.26	202	402	4	160	1	95	164	1	26	DC Brake Active	BYTE	1	x0
P3.27	219	402	2	160	1	96	164	1	27	Smoke Mode	BYTE	1	x0
P3.28	220	402	3	160	1	97	164	1	28	Fire Mode	BYTE	1	x0
P3.29	221	439	0	160	1	98	164	1	29	Fire Mode Ref 1/2 Select	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
P3.30	351	410	0	160	1	99	164	1	30	PID1 Set Point Select	BYTE	1	x0
P3.31	352	410	1	160	1	100	164	1	31	PID2 Set Point Select	BYTE	1	x0
P3.32	199	400	8	160	1	101	164	1	32	Jog Enable	BYTE	1	x0
P3.33	224	3104	0	160	1	102	164	1	33	Start Timer 1	BYTE	1	x0
P3.34	225	3104	1	160	1	103	164	1	34	Start Timer 2	BYTE	1	x0
P3.35	226	3104	2	160	1	104	164	1	35	Start Timer 3	BYTE	1	x0
P3.36	208	415	0	160	1	105	164	1	36	AI Ref Source Select	BYTE	1	x0
P3.37	210	1910	0	160	1	106	164	1	37	Motor Interlock 1	BYTE	1	x0
P3.38	211	1910	1	160	1	107	164	1	38	Motor Interlock 2	BYTE	1	x0
P3.39	212	1910	2	160	1	108	164	1	39	Motor Interlock 3	BYTE	1	x0
P3.40	213	1910	3	160	1	109	164	1	40	Motor Interlock 4	BYTE	1	x0
P3.41	214	1910	4	160	1	110	164	1	41	Motor Interlock 5	BYTE	1	x0
P3.42	747	400	2	160	1	111	164	1	42	Emergency Stop	BYTE	1	x0
P3.43	1246	1804	0	160	1	113	164	1	43	Bypass Overload	BYTE	1	x0
P3.44	2119	NA	NA	164	1	76	164	1	44	Fire Mode Direction Invert	BYTE	1	x0
P3.45	2206	NA	NA	NA	NA	NA	NA	NA	NA	IO Terminal 2 Start Stop Logic	BYTE	1	x0
P3.46	2207	NA	NA	NA	NA	NA	NA	NA	NA	IO Terminal 2 Start Signal 1	BYTE	1	x0
P3.47	2208	NA	NA	NA	NA	NA	NA	NA	NA	IO Terminal 2 Start Signal 2	BYTE	1	x0
P3.48	2293	NA	NA	NA	NA	NA	NA	NA	NA	Ext. Fault 2 NO	BYTE	1	x0
P3.49	2294	NA	NA	NA	NA	NA	NA	NA	NA	Ext. Fault 2 NC	BYTE	1	x0
P3.50	2295	NA	NA	NA	NA	NA	NA	NA	NA	Ext. Fault 3 NO	BYTE	1	x0
P3.51	2296	NA	NA	NA	NA	NA	NA	NA	NA	Ext. Fault 3 NC	BYTE	1	x0
P3.52	2297	NA	NA	NA	NA	NA	NA	NA	NA	Ext. Fault 1 Text	BYTE	1	x0
P3.53	2298	NA	NA	NA	NA	NA	NA	NA	NA	Ext. Fault 2 Text	BYTE	1	x0
P3.54	2299	NA	NA	NA	NA	NA	NA	NA	NA	Ext. Fault 3 Text	BYTE	1	x0
P3.55	2312	NA	NA	NA	NA	NA	NA	NA	NA	Parameter Set1/2 Sel	BYTE	1	x0
P3.56	2394	NA	NA	NA	NA	NA	NA	NA	NA	Deragging Enable	BYTE	1	x0
P3.57	2395	NA	NA	NA	NA	NA	NA	NA	NA	HOA On/Off	BYTE	1	x0
P4.1	227	276	0	160	1	114	165	1	1	AO1 Mode	BYTE	1	x0
P4.2	146	460	0	160	1	116	165	1	2	AO1 Function	BYTE	1	x0
P4.3	149	279	0	160	1	117	165	1	3	AO1 Minimum	BYTE	1	x0
P4.4	147	277	0	160	1	118	165	1	4	AO1 Filter Time	INTEGER	2	x100
P4.5	150	274	0	160	1	119	165	1	5	AO1 Scale	INTEGER	2	x0
P4.6	148	278	0	160	1	120	165	1	6	AO1 Inversion	BOOLEAN	1	x0
P4.7	173	275	0	160	1	121	165	1	7	AO1 Offset	INTEGER	2	x100
P4.8	228	276	1	160	1	115	165	1	8	AO2 Mode	BYTE	1	x0
P4.9	229	460	1	160	1	122	165	1	9	AO2 Function	BYTE	1	x0
P4.10	232	279	1	160	1	123	165	1	10	AO2 Minimum	BYTE	1	x0
P4.11	230	277	1	160	1	124	165	1	11	AO2 Filter Time	INTEGER	2	x100
P4.12	233	274	1	160	1	125	165	1	12	AO2 Scale	INTEGER	2	x0
P4.13	231	278	1	160	1	126	165	1	13	AO2 Inversion	BOOLEAN	1	x0
P4.14	234	275	1	160	1	127	165	1	14	AO2 Offset	INTEGER	2	x100
P5.1	151	461	0	160	1	128	166	1	1	DO1 Function	BYTE	1	x0
P5.2	152	451	0	160	1	129	166	1	2	RO1 Function	BYTE	1	x0
P5.3	153	451	1	160	1	130	166	1	3	RO2 Function	BYTE	1	x0
P5.4	538	451	2	160	1	131	166	1	4	RO3 Function	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P5.5	2463	NA	NA	NA	NA	NA	NA	NA	NA	Virtual RO1 Function	BYTE	1	x0
P5.6	2464	NA	NA	NA	NA	NA	NA	NA	NA	Virtual RO2 Function	BYTE	1	x0
P5.7	154	1201	0	160	1	132	166	1	5	Freq Limit 1 Supv	BYTE	1	x0
P5.8	155	1101	0	160	1	133	166	1	6	Freq Limit 1 Supv Val	INTEGER	2	x100
P5.9	157	1201	1	160	1	134	166	1	7	Freq Limit 2 Supv	BYTE	1	x0
P5.10	158	1101	1	160	1	135	166	1	8	Freq Limit 2 Supv Val	INTEGER	2	x100
P5.11	159	1202	0	160	1	136	166	1	9	Torque Limit Supv	BYTE	1	x0
P5.12	160	1102	0	160	1	137	166	1	10	Torque Limit Supv Val	INTEGER	2	x10
P5.13	161	1200	0	160	1	138	166	1	11	Ref Limit Supv	BYTE	1	x0
P5.14	162	1100	0	160	1	139	166	1	12	Ref Limit Supv Val	INTEGER	2	x100
P5.15	163	2205	1	160	1	140	166	1	13	Ext Brake Off Delay	INTEGER	2	x10
P5.16	164	2205	0	160	1	141	166	1	14	Ext Brake On Delay	INTEGER	2	x10
P5.17	165	1222	1	160	1	142	166	1	15	Temp Limit Supv	BYTE	1	x0
P5.18	166	822	0	160	1	143	166	1	16	Temp Limit Supv Val	INTEGER	2	x10
P5.19	167	1203	0	160	1	144	166	1	17	Power Limit Supv	BYTE	1	x0
P5.20	168	1103	0	160	1	145	166	1	18	Power Limit Supv Val	INTEGER	2	x10
P5.21	170	1504	0	160	1	146	166	1	19	AI Supv Select	BYTE	1	x0
P5.22	171	1204	0	160	1	147	166	1	20	AI Limit Supv	BYTE	1	x0
P5.23	172	1404	0	160	1	148	166	1	21	AI Limit Supv Val	INTEGER	2	x100
P5.24	1346	2860	0	161	1	6	166	1	22	PID1 Superv Enable	BOOLEAN	1	x0
P5.25	1347	2861	0	161	1	7	166	1	23	PID1 Superv Upper Limit	DOUBLE	4	x100
P5.26	1349	2862	0	161	1	8	166	1	24	PID1 Superv Lower Limit	DOUBLE	4	x100
P5.27	1351	2863	0	161	1	9	166	1	25	PID1 Superv Delay	INTEGER	2	x0
P5.28	1408	2860	1	161	1	59	166	1	26	PID2 Superv Enable	BOOLEAN	1	x0
P5.29	1409	2861	1	161	1	60	166	1	27	PID2 Superv Upper Limit	DOUBLE	4	x100
P5.30	1411	2862	1	161	1	61	166	1	28	PID2 Superv Lower Limit	DOUBLE	4	x100
P5.31	1413	2863	1	161	1	62	166	1	29	PID2 Superv Delay	INTEGER	2	x0
P5.32	2112	NA	NA	164	1	69	166	1	30	RO1 On Delay	INTEGER	2	x10
P5.33	2113	NA	NA	164	1	70	166	1	31	RO1 Off Delay	INTEGER	2	x10
P5.34	2114	NA	NA	164	1	71	166	1	32	RO2 On Delay	INTEGER	2	x10
P5.35	2115	NA	NA	164	1	72	166	1	33	RO2 Off Delay	INTEGER	2	x10
P5.36	2116	NA	NA	164	1	73	166	1	34	RO3 On Delay	INTEGER	2	x10
P5.37	2117	NA	NA	164	1	74	166	1	35	RO3 Off Delay	INTEGER	2	x10
P5.38	2118	NA	NA	164	1	75	166	1	36	RO3 Reverse	BYTE	1	x0
P5.39	2189	NA	NA	NA	NA	NA	NA	NA	NA	Motor Current 1 Supv	BYTE	1	x0
P5.40	2190	NA	NA	NA	NA	NA	NA	NA	NA	Motor Current 1 Supv Value	INTEGER	2	x10
P5.41	2191	NA	NA	NA	NA	NA	NA	NA	NA	Motor Current 2 Supv	BYTE	1	x0
P5.42	2192	NA	NA	NA	NA	NA	NA	NA	NA	Motor Current 2 Supv Value	INTEGER	2	x10
P5.43	2193	NA	NA	NA	NA	NA	NA	NA	NA	Second AI Supv Select	BYTE	1	x0
P5.44	2194	NA	NA	NA	NA	NA	NA	NA	NA	Second AI Limit Supv	BYTE	1	x0
P5.45	2195	NA	NA	NA	NA	NA	NA	NA	NA	Second AI Limit Supv Val	INTEGER	2	x100
P5.46	2196	NA	NA	NA	NA	NA	NA	NA	NA	Motor Current 1 Supv Hyst	BYTE	1	x10

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
P5.47	2197	NA	NA	NA	NA	NA	NA	NA	NA	Motor Current 2 Supv Hyst	BYTE	1	x10
P5.48	2198	NA	NA	NA	NA	NA	NA	NA	NA	AI Supv Hyst	INTEGER	2	x100
P5.49	2199	NA	NA	NA	NA	NA	NA	NA	NA	Second AI Supv Hyst	INTEGER	2	x100
P5.50	2200	NA	NA	NA	NA	NA	NA	NA	NA	Freq Limit 1 Supv Hyst	INTEGER	2	x100
P5.51	2201	NA	NA	NA	NA	NA	NA	NA	NA	Freq Limit 2 Supv Hyst	INTEGER	2	x100
P5.52	2202	NA	NA	NA	NA	NA	NA	NA	NA	Torque Limit Supv Hyst	INTEGER	2	x10
P5.53	2203	NA	NA	NA	NA	NA	NA	NA	NA	Ref Limit Supv Hyst	INTEGER	2	x100
P5.54	2204	NA	NA	NA	NA	NA	NA	NA	NA	Temp Limit Supv Hyst	INTEGER	2	x10
P5.55	2205	NA	NA	NA	NA	NA	NA	NA	NA	Power Limit Supv Hyst	INTEGER	2	x10
P6.1	751	2002	0	162	1	84	167	1	1	Logic Function Select	BYTE	1	x0
P6.2	752	2000	0	162	1	85	167	1	2	Logic Operation Input A	BYTE	1	x0
P6.3	753	2001	0	162	1	86	167	1	3	Logic Operation Input B	BYTE	1	x0
P7.1	138	408	1	160	1	151	168	1	1	Remote 2 Control Place	BYTE	1	x0
P7.2	139	437	1	160	1	154	168	1	2	Remote 2 Reference	BYTE	1	x0
P7.3	141	1	8	160	1	155	161	1	12	Keypad Reference	INTEGER	2	x100
P7.4	116	621	1	160	1	156	168	1	4	Keypad Direction	BOOLEAN	1	x0
P7.5	114	622	1	160	1	157	168	1	5	Keypad Stop	BOOLEAN	1	x0
P7.6	117	1	9	160	1	159	168	1	6	Jog Reference	INTEGER	2	x100
P7.7	156	111	4	160	1	160	168	1	7	Motor Pot Ramp Time	INTEGER	2	x10
P7.8	169	426	0	160	1	161	168	1	8	Motor Pot Ref Reset	BYTE	1	x0
P7.9	252	620	0	160	1	167	168	1	9	Start Mode	BYTE	1	x0
P7.10	253	620	1	160	1	168	168	1	10	Stop Mode	BYTE	1	x0
P7.11	247	117	0	160	1	166	168	1	11	Ramp 1 Shape	INTEGER	2	x10
P7.12	248	117	1	160	1	172	168	1	12	Ramp 2 Shape	INTEGER	2	x10
P7.13	249	130	1	160	1	170	168	1	13	Accel Time 2	INTEGER	2	x10
P7.14	250	134	1	160	1	171	168	1	14	Decel Time 2	INTEGER	2	x10
P7.15	256	41	0	160	1	173	168	1	15	Skip F1 Low Limit	INTEGER	2	x100
P7.16	257	42	0	160	1	174	168	1	16	Skip F1 High Limit	INTEGER	2	x100
P7.17	258	41	1	160	1	175	168	1	17	Skip F2 Low Limit	INTEGER	2	x100
P7.18	259	42	1	160	1	176	168	1	18	Skip F2 High Limit	INTEGER	2	x100
P7.19	260	41	2	160	1	177	168	1	19	Skip F3 Low Limit	INTEGER	2	x100
P7.20	261	42	2	160	1	178	168	1	20	Skip F3 High Limit	INTEGER	2	x100
P7.21	264	43	0	160	1	179	168	1	21	Skip Range Ramp Factor	INTEGER	2	x10
P7.22_	267	639	0	160	1	180	168	1	22	Power Loss Function	BYTE	1	x0
P7.23_	268	151	0	160	1	181	168	1	23	Power Loss Time	INTEGER	2	x10
P7.24	2122	NA	NA	164	1	78	168	1	24	Currency	BYTE	1	x0
P7.25	2123	NA	NA	164	1	79	168	1	25	Energy Cost	INTEGER	2	x100
P7.26	2124	NA	NA	164	1	80	168	1	26	Data Type	BYTE	1	x0
P7.27	2125	NA	NA	164	1	81	168	1	27	Energy Savings Reset	BYTE	1	x0
P7.28	2444	NA	NA	NA	NA	NA	NA	NA	NA	2th Stage Ramp Frequency	INTEGER	2	x100
P7.29	2515	NA	NA	NA	NA	NA	NA	NA	NA	Change PhaseSequence Motor	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P8.1	287	255	0	161	1	81	168	1	28	Motor Control Mode	BYTE	1	x0
P8.2	107	281	0	42	1	10	42	1	10	Current Limit	INTEGER	2	x10
P8.3	109	60	0	161	1	82	168	1	30	V/Hz Optimization	BOOLEAN	1	x0
P8.4	108	61	0	161	1	74	168	1	31	V/Hz Ratio	BYTE	1	x0
P8.5	289	23	0	161	1	75	168	1	32	Field Weakening Point	INTEGER	2	x100
P8.6	290	24	0	161	1	76	168	1	33	Voltage at FWP	INTEGER	2	x100
P8.7	291	23	1	161	1	77	168	1	34	V/Hz Mid Frequency	INTEGER	2	x100
P8.8	292	24	1	161	1	78	168	1	35	V/Hz Mid Voltage	INTEGER	2	x100
P8.9	293	27	0	161	1	79	168	1	36	Zero Frequency Voltage	INTEGER	2	x100
P8.10	2522	NA	NA	NA	NA	NA	NA	NA	NA	Switching Frequency	INTEGER	2	x10
P8.11	1665	341	0	164	1	22	168	1	38	Sine Filter Enable	BYTE	1	x0
P8.12	294	626	3	161	1	83	168	1	39	OverVoltage Control	BYTE	1	x0
P8.13	298	2901	0	161	1	84	168	1	40	Load Drooping	INTEGER	2	x100
P8.14	299	340	0	161	1	85	168	1	41	Identification	BYTE	1	x0
P8.15	1574	20	7	163	1	193	168	1	42	Neg Frequency Limit	DOUBLE	4	x100
P8.16	1576	20	6	163	1	194	168	1	43	Pos Frequency Limit	DOUBLE	4	x100
P8.17_	1585	140	0	163	1	199	168	1	44	Frequency Ramp Out FilterTime Constant	INTEGER	2	x0
P8.18	1591	2406	1	163	1	203	168	1	45	Speed Error Filter Time Constant	INTEGER	2	x0
P8.19_	1592	2405	0	163	1	204	168	1	46	Speed Error Band Stop Frequency	INTEGER	2	x100
P8.20	1593	2400	0	163	1	205	168	1	47	Speed Control Kp	INTEGER	2	x10
P8.21	1594	2401	0	163	1	206	168	1	48	Speed Control Ti	INTEGER	2	x0
P8.22_	1595	2400	3	163	1	207	168	1	49	Speed Control Kp At Field Weakening	INTEGER	2	x10
P8.23_	1596	2400	1	163	1	208	168	1	50	Speed Control Kp Below F0	INTEGER	2	x10
P8.24_	1597	2403	0	163	1	209	168	1	51	Speed Control F0	INTEGER	2	x100
P8.25_	1598	2403	1	163	1	210	168	1	52	Speed Control F1	INTEGER	2	x100
P8.26_	1599	2410	0	163	1	211	168	1	53	Speed Control Kp Below T0	INTEGER	2	x10
P8.27_	1600	2404	0	163	1	212	168	1	54	Speed Control T0	INTEGER	2	x10
P8.28_	1601	2406	0	163	1	213	168	1	55	Speed Control Kp Filter Time Constant	INTEGER	2	x0
P8.29	1602	30	1	163	1	214	168	1	56	Motoring Torque Limit	INTEGER	2	x10
P8.30	1603	31	1	163	1	215	168	1	57	Generator Torque Limit	INTEGER	2	x10
P8.31	1604	36	1	163	1	216	168	1	58	Torque Limit Forward	INTEGER	2	x10
P8.32	1605	37	1	163	1	217	168	1	59	Torque Limit Reverse	INTEGER	2	x10
P8.33	1607	282	0	163	1	219	168	1	60	Motoring Power Limit	INTEGER	2	x10
P8.34	1608	282	1	163	1	220	168	1	61	Generator Power Limit	INTEGER	2	x10
P8.35_	1611	2420	0	163	1	223	168	1	62	Acc Compensation Time Constant	INTEGER	2	x10
P8.36_	1612	2421	0	163	1	224	168	1	63	Acc Compensation Filter Time Constant	INTEGER	2	x0
P8.37	1620	254	0	163	1	232	168	1	64	Flux Reference	INTEGER	2	x10
P8.38_	1621	237	0	163	1	233	168	1	65	Stop State Magnetisation	INTEGER	2	x10
P8.39_	1622	132	0	163	1	234	168	1	66	Start Boost Rise Time	INTEGER	2	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
P8.40_	1623	105	0	163	1	235	168	1	67	Flux Current Ramp Time	INTEGER	2	x0
P8.41_	1624	118	2	163	1	236	168	1	68	Zero Speed Start Time	INTEGER	2	x0
P8.42_	1625	118	3	163	1	237	168	1	69	Zero Speed Stop Time	INTEGER	2	x0
P8.43	1630	2902	0	163	1	241	168	1	70	Droop Control Filter Time Constant	INTEGER	2	x0
P8.44	1631	420	4	163	1	242	168	1	71	Startup Torque Selection	INTEGER	2	x0
P8.45	1632	2	3	163	1	243	168	1	72	Torque Memory Start	INTEGER	2	x10
P8.46	1633	36	0	163	1	244	168	1	73	Startup Torque Forward	INTEGER	2	x10
P8.47	1634	37	0	163	1	245	168	1	74	Startup Torque Reverse	INTEGER	2	x10
P8.48	1635	506	1	163	1	246	168	1	75	Startup Torque Actual	INTEGER	2	x10
P8.49	1667	133	0	164	1	21	168	1	76	Startup Torque Time	INTEGER	2	x0
P8.50	771	218	0	162	1	123	168	1	77	Stator Resistor	INTEGER	2	x1000
P8.51_	772	221	0	162	1	124	168	1	78	Rotor Resistor	INTEGER	2	x1000
P8.52	773	224	0	162	1	125	168	1	79	Leak Inductance	INTEGER	2	x100
P8.53_	774	225	0	162	1	126	168	1	80	Mutual Inductance	INTEGER	2	x10
P8.54	775	223	0	162	1	127	168	1	81	Excitation Current	INTEGER	2	x10
P8.55_	58	NA	NA	NA	NA	NA	NA	NA	NA	Advanced Open Loop Options	DOUBLE	4	x0
P8.56_	63	NA	NA	NA	NA	NA	NA	NA	NA	Torque Stability Gain	INTEGER	2	x10
P8.57_	64	NA	NA	NA	NA	NA	NA	NA	NA	Torque Stability FWP Gain	INTEGER	2	x10
P8.58_	62	NA	NA	NA	NA	NA	NA	NA	NA	Torque Stability Dampening Time	INTEGER	2	x10000
P9.1	306	840	29520	160	1	182	169	1	1	4mA Input Fault	BYTE	1	x0
P9.2	331	1	7	160	1	183	169	1	2	4mA Fault Frequency	INTEGER	2	x100
P9.3	307	840	36864	160	1	197	169	1	3	External Fault	BYTE	1	x0
P9.4	332	840	12592	160	1	198	169	1	4	Input Phase Fault	BYTE	1	x0
P9.5	330	840	12576	160	1	202	169	1	5	Uvolt Fault Response	BYTE	1	x0
P9.6	308	840	9040	160	1	199	169	1	6	Output Phase Fault	BYTE	1	x0
P9.7	309	840	9008	160	1	203	169	1	7	Ground Fault	BYTE	1	x0
P9.8	310	840	17168	160	1	192	169	1	8	Motor Thermal Protection	BYTE	1	x0
P9.9	311	1012	0	160	1	193	169	1	9	Motor Thermal F0 Current	INTEGER	2	x10
P9.10	312	1011	0	160	1	194	169	1	10	Motor Thermal Time	BYTE	1	x0
P9.11	313	840	28963	160	1	184	169	1	11	Stall Protection	BYTE	1	x0
P9.12	314	1010	0	160	1	185	169	1	12	Stall Current Limit	INTEGER	2	x10
P9.13	315	1010	1	160	1	186	169	1	13	Stall Time Limit	INTEGER	2	x10
P9.14	316	1010	2	160	1	187	169	1	14	Stall Frequency Limit	INTEGER	2	x100
P9.15	317	840	28979	160	1	188	169	1	15	Underload Protection	BYTE	1	x0
P9.16	318	1013	0	160	1	189	169	1	16	Underload Fnom Torque	INTEGER	2	x10
P9.17	319	1013	1	160	1	190	169	1	17	Underload F0 Torque	INTEGER	2	x10
P9.18	320	1011	1	160	1	191	169	1	18	Underload Time Limit	INTEGER	2	x100
P9.19	333	840	28978	160	1	201	169	1	19	Thermistor Fault Response	BYTE	1	x0
P9.20	750	861	0	162	1	83	169	1	20	Line Start Lockout	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P9.21	334	840	29953	160	1	195	169	1	21	Fieldbus Fault Response	BYTE	1	x0
P9.22	335	840	35088	160	1	196	169	1	22	OPTCard Fault Response	BYTE	1	x0
P9.23	1564	840	16912	163	1	188	169	1	23	Unit Under Temp Prot	BYTE	1	x0
P9.24	321	846	0	160	1	206	169	1	24	AR Wait Time	INTEGER	2	x100
P9.25	322	846	1	160	1	207	169	1	25	AR Trail Time	INTEGER	2	x100
P9.26	323	847	0	160	1	208	169	1	26	AR Start Function	BYTE	1	x0
P9.27	324	845	12832	160	1	209	169	1	27	Undervoltage Attempts	BYTE	1	x0
P9.28	325	845	12816	160	1	210	169	1	28	OverVoltage Attempts	BYTE	1	x0
P9.29	326	845	8736	160	1	211	169	1	29	OverCurrent Attempts	BYTE	1	x0
P9.30	327	845	29520	160	1	212	169	1	30	4mA Fault Attempts	BYTE	1	x0
P9.31	329	845	28978	160	1	213	169	1	31	Motor Temp Fault Attempts	BYTE	1	x0
P9.32	328	845	36864	160	1	214	169	1	32	External Fault Attempts	BYTE	1	x0
P9.33	336	845	28979	160	1	215	169	1	33	Underload Attempts	BYTE	1	x0
P9.34	955	840	35344	160	1	204	169	1	34	RTC Fault	BYTE	1	x0
P9.35	337	840	29536	160	1	205	169	1	35	PT100 Fault Response	BYTE	1	x0
P9.36	1256	840	35345	163	1	127	169	1	36	Replace Battery Fault Response	BYTE	1	x0
P9.37	1257	840	28688	163	1	128	169	1	37	Replace Fan Fault Response	BYTE	1	x0
P9.38	1678	840	30070	163	1	187	169	1	38	IP Address Confliction Resp	BYTE	1	x0
P9.39_	2126	NA	NA	164	1	82	169	1	39	Cold Weather Mode	BYTE	1	x0
P9.40_	2127	NA	NA	164	1	83	169	1	40	Cold Weather Volt. Level	BYTE	1	x10
P9.41_	2128	NA	NA	164	1	84	169	1	41	Cold Weather Time Out	BYTE	1	x0
P9.42_	2129	NA	NA	164	1	85	169	1	42	Cold Weather Password	INTEGER	2	x0
P9.43	2130	NA	NA	164	1	86	169	1	43	Under Temp Fault Override	BYTE	1	x0
P9.44	2158	NA	NA	164	1	113	169	1	44	Ground Fault Limit	BYTE	1	x0
P9.45	2157	NA	NA	164	1	112	169	1	45	Keypad Comm Fault Response	BYTE	1	x0
P9.46	2159	NA	NA	164	1	114	169	1	46	Preheat Mode	BYTE	1	x0
P9.47	2160	NA	NA	164	1	115	169	1	47	Preheat Control Source	BYTE	1	x0
P9.48	2161	NA	NA	164	1	116	169	1	48	Preheat Enter Temp	INTEGER	2	x10
P9.49	2162	NA	NA	164	1	117	169	1	49	Preheat Quit Temp	INTEGER	2	x10
P9.50	2163	NA	NA	164	1	118	169	1	50	Preheat Output Volt\ Current_	BYTE	1	x0
P9.51	2401	NA	NA	NA	NA	NA	NA	NA	NA	PID Feedback AI Loss Response	BYTE	1	x0
P9.52	2402	NA	NA	NA	NA	NA	NA	NA	NA	PID Feedback AI Loss Pre Freq	INTEGER	2	x100
P9.53	2403	NA	NA	NA	NA	NA	NA	NA	NA	PID Feedback AI Loss Pipe Fill Loss Level	INTEGER	2	x10
P9.54	2404	NA	NA	NA	NA	NA	NA	NA	NA	PID Feedback AI Loss PreFreq Timeout	INTEGER	2	x0
P9.55	2405	NA	NA	NA	NA	NA	NA	NA	NA	PID Feedback AI Loss Attempts	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P9.56	2427	NA	NA	NA	NA	NA	NA	NA	NA	STO Fault Response	BYTE	1	x0
P9.57	2483	NA	NA	NA	NA	NA	NA	NA	NA	Fault Reset Start	BYTE	1	x0
P10.1	1294	2100	0	160	1	216	170	1	1	PID1 Control Gain	INTEGER	2	x100
P10.2	1295	2101	0	160	1	217	170	1	2	PID1 Control ITime	INTEGER	2	x100
P10.3	1296	2102	0	160	1	218	170	1	3	PID1 Control DTime	INTEGER	2	x100
P10.4	1297	2870	0	160	1	219	170	1	4	PID1 Process Unit	BYTE	1	x0
P10.5	1298	2871	0	160	1	221	170	1	5	PID1 Process Unit Min	DOUBLE	4	x100
P10.6	1300	2872	0	160	1	222	170	1	6	PID1 Process Unit Max	DOUBLE	4	x100
P10.7	1302	2873	0	160	1	220	170	1	7	PID1 Process Unit Decimal	BYTE	1	x0
P10.8	1303	2850	0	160	1	223	170	1	8	PID1 Error Inversion	BOOLEAN	1	x0
P10.9	1304	2851	0	160	1	224	170	1	9	PID1 Dead Band	DOUBLE	4	x100
P10.10	1306	2852	0	160	1	225	170	1	10	PID1 Dead Band Delay	INTEGER	2	x100
P10.11	1307	2170	0	160	1	226	170	1	11	PID1 Keypad Set Point 1	DOUBLE	4	x100
P10.12	1309	2179	0	160	1	227	170	1	12	PID1 Keypad Set Point 2	DOUBLE	4	x100
P10.13	1311	2151	0	160	1	228	170	1	13	PID1 Ramp Time	INTEGER	2	x100
P10.14	1312	2110	0	160	1	229	170	1	14	PID1 Set Point 1 Source	BYTE	1	x0
P10.15	1313	2168	0	160	1	230	170	1	15	PID1 Set Point 1 Min	INTEGER	2	x100
P10.16	1314	2169	0	160	1	231	170	1	16	PID1 Set Point 1 Max	INTEGER	2	x100
P10.17	1315	2136	0	160	1	232	170	1	17	PID1 Set Point 1 Sleep Enable	BOOLEAN	1	x0
P10.18	2396	NA	NA	NA	NA	NA	NA	NA	NA	PID1 Set Point 1 Sleep Unit Sel	BYTE	1	x0
P10.19	2450	2137	0	NA	NA	NA	170	1	18	PID1 Set Point 1 Sleep Level	DOUBLE	4	x100
P10.20	1317	2138	0	160	1	234	170	1	19	PID1 Set Point 1 Sleep Delay	INTEGER	2	x0
P10.21	1318	2139	0	160	1	235	170	1	20	PID1 Set Point 1 Wake Up Level	DOUBLE	4	x100
P10.22	1320	2154	0	160	1	236	170	1	21	PID1 Set Point 1 Boost	BYTE	1	x10
P10.23	1321	2116	0	160	1	237	170	1	22	PID1 Set Point 2 Source	BYTE	1	x0
P10.24	1322	2177	0	160	1	238	170	1	23	PID1 Set Point 2 Min	INTEGER	2	x100
P10.25	1323	2178	0	160	1	239	170	1	24	PID1 Set Point 2 Max	INTEGER	2	x100
P10.26	1324	2140	0	160	1	240	170	1	25	PID1 Set Point 2 Sleep Enable	BOOLEAN	1	x0
P10.27	2397	NA	NA	NA	NA	NA	NA	NA	NA	PID1 Set Point 2 Sleep Unit Sel	BYTE	1	x0
P10.28	2452	2141	0	NA	NA	NA	170	1	26	PID1 Set Point 2 Sleep Level	DOUBLE	4	x100
P10.29	1326	2142	0	160	1	242	170	1	27	PID1 Set Point 2 Sleep Delay	INTEGER	2	x0
P10.30	1327	2143	0	160	1	243	170	1	28	PID1 Set Point 2 Wake Up Level	DOUBLE	4	x100
P10.31	1329	2157	0	160	1	244	170	1	29	PID1 Set Point 2 Boost	BYTE	1	x10
P10.32	1330	2171	0	160	1	245	170	1	30	PID1 Feedback Function	BYTE	1	x0
P10.33	1331	2153	0	160	1	246	170	1	31	PID1 Feedback Gain	INTEGER	2	x10

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
P10.34	1332	2112	0	160	1	247	170	1	32	PID1 Feedback 1 Source	BYTE	1	x0
P10.35	1333	2172	0	160	1	248	170	1	33	PID1 Feedback 1 Min	INTEGER	2	x100
P10.36	1334	2173	0	160	1	249	170	1	34	PID1 Feedback 1 Max	INTEGER	2	x100
P10.37	1335	2117	0	160	1	250	170	1	35	PID1 Feedback 2 Source	BYTE	1	x0
P10.38	1336	2181	0	160	1	251	170	1	36	PID1 Feedback 2 Min	INTEGER	2	x100
P10.39	1337	2182	0	160	1	252	170	1	37	PID1 Feedback 2 Max	INTEGER	2	x100
P10.40	1338	2800	0	160	1	253	170	1	38	PID1 Feedforward Func	BYTE	1	x0
P10.41	1339	2801	0	160	1	254	170	1	39	PID1 Feedforward Gain	INTEGER	2	x10
P10.42	1340	2810	0	160	1	255	170	1	40	PID1 Feedforward 1 Source	BYTE	1	x0
P10.43	1341	2811	0	161	1	1	170	1	41	PID1 Feedforward 1 Min	INTEGER	2	x100
P10.44	1342	2812	0	161	1	2	170	1	42	PID1 Feedforward 1 Max	INTEGER	2	x100
P10.45	1343	2815	0	161	1	3	170	1	43	PID1 Feedforward 2 Source	BYTE	1	x0
P10.46	1344	2816	0	161	1	4	170	1	44	PID1 Feedforward 2 Min	INTEGER	2	x100
P10.47	1345	2817	0	161	1	5	170	1	45	PID1 Feedforward 2 Max	INTEGER	2	x100
P10.48	1352	2830	0	161	1	10	170	1	46	PID1 Set Point 1 Comp Enable	BOOLEAN	1	x0
P10.49	1353	2831	0	161	1	11	170	1	47	PID1 Set Point 1 Comp Max	INTEGER	2	x100
P10.50	1354	2835	0	161	1	12	170	1	48	PID1 Set Point 2 Comp Enable	BOOLEAN	1	x0
P10.51	1355	2836	0	161	1	13	170	1	49	PID1 Set Point 2 Comp Max	INTEGER	2	x100
P10.52	2466	NA	NA	NA	NA	NA	NA	NA	NA	PID1 Wake Up Action	BYTE	1	x0
P10.53	2542	NA	NA	NA	NA	NA	NA	NA	NA	FB PID1 Set Point 1	DOUBLE	4	x100
P10.54	2544	NA	NA	NA	NA	NA	NA	NA	NA	FB PID1 Set Point 2	DOUBLE	4	x100
P10.55	2550	NA	NA	NA	NA	NA	NA	NA	NA	FB PID1 Feedback 1	INTEGER	2	x100
P10.56	2551	NA	NA	NA	NA	NA	NA	NA	NA	FB PID1 Feedback 2	INTEGER	2	x100
P10.57	2554	NA	NA	NA	NA	NA	NA	NA	NA	FB PID1 Feedforward 1	INTEGER	2	x100
P10.58	2555	NA	NA	NA	NA	NA	NA	NA	NA	FB PID1 Feedforward 2	INTEGER	2	x100
P11.1	1356	2100	1	161	1	14	171	1	1	PID2 Control Gain	INTEGER	2	x100
P11.2	1357	2101	1	161	1	15	171	1	2	PID2 Control I Time	INTEGER	2	x100
P11.3	1358	2102	1	161	1	16	171	1	3	PID2 Control D Time	INTEGER	2	x100
P11.4	1359	2870	1	161	1	17	171	1	4	PID2 Process Unit	BYTE	1	x0
P11.5	1360	2871	1	161	1	19	171	1	5	PID2 Process Unit Min	DOUBLE	4	x100
P11.6	1362	2872	1	161	1	20	171	1	6	PID2 Process Unit Max	DOUBLE	4	x100
P11.7	1364	2873	1	161	1	18	171	1	7	PID2 Process Unit Decimal	BYTE	1	x0
P11.8	1365	2850	1	161	1	21	171	1	8	PID2 Error Inversion	BOOLEAN	1	x0
P11.9	1366	2851	1	161	1	22	171	1	9	PID2 Dead Band	DOUBLE	4	x100
P11.10	1368	2852	1	161	1	23	171	1	10	PID2 Dead Band Delay	INTEGER	2	x100

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
P11.11	1369	2170	1	161	1	24	171	1	11	PID2 Keypad Set Point 1	DOUBLE	4	x100
P11.12	1371	2179	1	161	1	25	171	1	12	PID2 Keypad Set Point 2	DOUBLE	4	x100
P11.13	1373	2151	1	161	1	26	171	1	13	PID2 Ramp Time	INTEGER	2	x100
P11.14	1374	2110	1	161	1	27	171	1	14	PID2 Set Point 1 Source	BYTE	1	x0
P11.15	1375	2168	1	161	1	28	171	1	15	PID2 Set Point 1 Min	INTEGER	2	x100
P11.16	1376	2169	1	161	1	29	171	1	16	PID2 Set Point 1 Max	INTEGER	2	x100
P11.17	1377	2136	1	161	1	30	171	1	17	PID2 Set Point 1 Sleep Enable	BOOLEAN	1	x0
P11.18	2398	NA	NA	NA	NA	NA	NA	NA	NA	PID2 Set Point 1 Sleep Unit Sel	BYTE	1	x0
P11.19	2454	2137	1	NA	NA	NA	171	1	18	PID2 Set Point 1 Sleep Level	DOUBLE	4	x100
P11.20	1379	2138	1	161	1	32	171	1	19	PID2 Set Point 1 Sleep Delay	INTEGER	2	x0
P11.21	1380	2139	1	161	1	33	171	1	20	PID2 Set Point 1 WakeUp Level	DOUBLE	4	x100
P11.22	1382	2154	1	161	1	34	171	1	21	PID2 Set Point 1 Boost	BYTE	1	x10
P11.23	1383	2116	1	161	1	35	171	1	22	PID2 Set Point 2 Source	BYTE	1	x0
P11.24	1384	2177	1	161	1	36	171	1	23	PID2 Set Point 2 Min	INTEGER	2	x100
P11.25	1385	2178	1	161	1	37	171	1	24	PID2 Set Point 2 Max	INTEGER	2	x100
P11.26	1386	2140	1	161	1	38	171	1	25	PID2 Set Point 2 Sleep Enable	BOOLEAN	1	x0
P11.27	2399	NA	NA	NA	NA	NA	NA	NA	NA	PID2 Set Point 2 Sleep Unit Sel	BYTE	1	x0
P11.28	2456	2141	1	NA	NA	NA	171	1	26	PID2 Set Point 2 Sleep Level	DOUBLE	4	x100
P11.29	1388	2142	1	161	1	40	171	1	27	PID2 Set Point 2 Sleep Delay	INTEGER	2	x0
P11.30	1389	2143	1	161	1	41	171	1	28	PID2 Set Point 2 WakeUp Level	DOUBLE	4	x100
P11.31	1391	2157	1	161	1	42	171	1	29	PID2 Set Point 2 Boost	BYTE	1	x10
P11.32	1392	2171	1	161	1	43	171	1	30	PID2 Feedback Func	BYTE	1	x0
P11.33	1393	2153	1	161	1	44	171	1	31	PID2 Feedback Gain	INTEGER	2	x10
P11.34	1394	2112	1	161	1	45	171	1	32	PID2 Feedback 1 Source	BYTE	1	x0
P11.35	1395	2172	1	161	1	46	171	1	33	PID2 Feedback 1 Min	INTEGER	2	x100
P11.36	1396	2173	1	161	1	47	171	1	34	PID2 Feedback 1 Max	INTEGER	2	x100
P11.37	1397	2117	1	161	1	48	171	1	35	PID2 Feedback 2 Source	BYTE	1	x0
P11.38	1398	2181	1	161	1	49	171	1	36	PID2 Feedback 2 Min	INTEGER	2	x100
P11.39	1399	2182	1	161	1	50	171	1	37	PID2 Feedback 2 Max	INTEGER	2	x100
P11.40	1400	2800	1	161	1	51	171	1	38	PID2 Feedforward Func	BYTE	1	x0
P11.41	1401	2801	1	161	1	52	171	1	39	PID2 Feedforward Gain	INTEGER	2	x10
P11.42	1402	2810	1	161	1	53	171	1	40	PID2 Feedforward 1 Source	BYTE	1	x0
P11.43	1403	2811	1	161	1	54	171	1	41	PID2 Feedforward 1 Min	INTEGER	2	x100

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P11.44	1404	2812	1	161	1	55	171	1	42	PID2 Feedforward 1 Max	INTEGER	2	x100
P11.45	1405	2815	1	161	1	56	171	1	43	PID2 Feedforward 2 Source	BYTE	1	x0
P11.46	1406	2816	1	161	1	57	171	1	44	PID2 Feedforward 2 Min	INTEGER	2	x100
P11.47	1407	2817	1	161	1	58	171	1	45	PID2 Feedforward 2 Max	INTEGER	2	x100
P11.48	1414	2830	1	161	1	63	171	1	46	PID2 Set Point1 Comp Enable	BOOLEAN	1	x0
P11.49	1415	2831	1	161	1	64	171	1	47	PID2 Set Point1 Comp Max	INTEGER	2	x100
P11.50	1416	2835	1	161	1	65	171	1	48	PID2 Set Point 2 Comp Enable	BOOLEAN	1	x0
P11.51	1417	2836	1	161	1	66	171	1	49	PID2 Set Point 2 Comp Max	INTEGER	2	x100
P11.52	2467	NA	NA	NA	NA	NA	NA	NA	NA	PID2 Wake Up Action	BYTE	1	x0
P11.53	2546	NA	NA	NA	NA	NA	NA	NA	NA	FB PID2 Set Point 1	DOUBLE	4	x100
P11.54	2548	NA	NA	NA	NA	NA	NA	NA	NA	FB PID2 Set Point 2	DOUBLE	4	x100
P11.55	2552	NA	NA	NA	NA	NA	NA	NA	NA	FB PID2 Feedback 1	INTEGER	2	x100
P11.56	2553	NA	NA	NA	NA	NA	NA	NA	NA	FB PID2 Feedback 2	INTEGER	2	x100
P11.57	2556	NA	NA	NA	NA	NA	NA	NA	NA	FB PID2 Feedforward 1	INTEGER	2	x100
P11.58	2557	NA	NA	NA	NA	NA	NA	NA	NA	FB PID2 Feedforward 2	INTEGER	2	x100
P12.1	105	5	1	161	1	67	172	1	1	Preset Speed 1	INTEGER	2	x100
P12.2	106	5	2	161	1	68	172	1	2	Preset Speed 2	INTEGER	2	x100
P12.3	118	5	3	161	1	69	172	1	3	Preset Speed 3	INTEGER	2	x100
P12.4	119	5	4	161	1	70	172	1	4	Preset Speed 4	INTEGER	2	x100
P12.5	120	5	5	161	1	71	172	1	5	Preset Speed 5	INTEGER	2	x100
P12.6	121	5	6	161	1	72	172	1	6	Preset Speed 6	INTEGER	2	x100
P12.7	122	5	7	161	1	73	172	1	7	Preset Speed 7	INTEGER	2	x100
P13.1	295	53	0	161	1	86	173	1	1	Torque Limit	INTEGER	2	x10
P13.2	303	420	2	161	1	89	173	1	2	Torque Ref Select	BYTE	1	x0
P13.3	782	2	2	162	1	138	161	1	11	Keypad Torque Ref	INTEGER	2	x10
P13.4	304	50	1	161	1	90	173	1	4	Torque Ref Max	INTEGER	2	x10
P13.5	305	50	0	161	1	91	173	1	5	Torque Ref Min	INTEGER	2	x10
P13.6	1666	NA	NA	164	1	23	173	1	6	Speed Limiter Mode	BYTE	1	x0
P13.7_	1636	3401	0	163	1	247	173	1	7	Window Pos Width	INTEGER	2	x100
P13.8_	1637	3401	1	163	1	248	173	1	8	Window Neg Width	INTEGER	2	x100
P13.9_	1638	3401	2	163	1	249	173	1	9	Window Pos Off Limit	INTEGER	2	x100
P13.10_	1639	3401	3	163	1	250	173	1	10	Window Neg Off Limit	INTEGER	2	x100
P13.11	1640	140	1	163	1	251	173	1	11	Torque Reference Filter TC	INTEGER	2	x0
P13.12_	1606	NA	NA	163	1	218	173	1	12	Pull Out Torque	INTEGER	2	x10
P13.13	1684	NA	NA	164	1	55	173	1	14	Stop State Magnetisation Time	INTEGER	2	x0
P13.14	2541	NA	NA	NA	NA	NA	NA	NA	NA	FB Torque Ref	INTEGER	2	x10
P13.15_	300	28	3	161	1	92	NA	NA	NA	Torque Control(2) Min Frequency	INTEGER	2	x100
P13.16_	301	NA	NA	161	1	93	NA	NA	NA	Torque Control(2) P-gain	INTEGER	2	x100

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P13.17_	302	NA	NA	161	1	94	NA	NA	NA	Torque Control(2) I-gain	INTEGER	2	x10
P13.18_	60	NA	NA	NA	NA	NA	NA	NA	NA	OL Trq Ctrl(6) P-gain	INTEGER	2	x100
P13.19_	61	NA	NA	NA	NA	NA	NA	NA	NA	OL Trq Ctrl(6) I-gain	INTEGER	2	x10
P14.1	254	2227	0	161	1	95	174	1	1	DC-Brake Current	INTEGER	2	x10
P14.2	263	2222	0	161	1	96	174	1	2	Start DC-Brake Time	INTEGER	2	x100
P14.3	262	2223	0	161	1	97	174	1	3	Stop DC-Brake Frequency	INTEGER	2	x100
P14.4	255	2222	1	161	1	98	174	1	4	Stop DC-Brake Time	INTEGER	2	x100
P14.5	251	2204	0	161	1	99	174	1	5	Brake Chopper Define	BYTE	1	x0
P14.6	266	2214	0	161	1	100	174	1	6	Flux Brake	BOOLEAN	1	x0
P14.7	265	2217	0	161	1	101	174	1	7	Flux Brake Current	INTEGER	2	x10
P15.1	535	640	0	161	1	102	175	1	1	Fire Mode Function	BOOLEAN	1	x0
P15.2	536	438	0	161	1	103	175	1	2	Fire Mode Ref Select Function	BYTE	1	x0
P15.3	537	28	2	161	1	104	175	1	3	Fire Mode Min Frequency	INTEGER	2	x100
P15.4	565	1	5	161	1	105	175	1	4	Fire Mode Freq Ref 1	INTEGER	2	x10
P15.5	564	1	6	161	1	106	175	1	5	Fire Mode Freq Ref 2	INTEGER	2	x10
P15.6	554	1	11	161	1	107	175	1	6	Smoke Purge Frequency	INTEGER	2	x10
P15.7	2443	NA	NA	NA	NA	NA	NA	NA	NA	Fire Mode Test Enable	BOOLEAN	1	x0
P16.1	577	210	1	40	3	6	40	3	6	Motor Nom Current 2	INTEGER	2	x10
P16.2	578	217	1	40	3	15	40	3	15	Motor Nom Speed 2	INTEGER	2	x0
P16.3	579	215	1	161	1	124	176	1	3	Motor PF 2	INTEGER	2	x100
P16.4	580	211	1	40	3	7	40	3	7	Motor Nom Volt 2	INTEGER	2	x0
P16.5	581	216	1	161	1	126	176	1	5	Motor Nom Freq 2	INTEGER	2	x100
P16.6	1419	218	1	162	1	128	176	1	6	Stator Resistor 2	INTEGER	2	x1000
P16.7_	1420	221	1	162	1	129	176	1	7	Rotor Resistor 2	INTEGER	2	x1000
P16.8	1421	224	1	162	1	130	176	1	8	Leak Inductance 2	INTEGER	2	x100
P16.9_	1422	225	1	162	1	131	176	1	9	Mutual Inductance 2	INTEGER	2	x10
P16.10	1423	223	1	162	1	132	176	1	10	Excitation Current 2	INTEGER	2	x10
P17.1.1	1418	1801	0	163	1	141	177	1	1	Bypass Enable	BOOLEAN	1	x0
P17.1.2	544	1802	0	161	1	129	177	1	2	Bypass Start Delay	INTEGER	2	x0
P17.1.3	542	1800	1	161	1	130	177	1	3	Auto Bypass	BOOLEAN	1	x0
P17.1.4	543	1802	1	161	1	131	177	1	4	Auto Bypass Delay	INTEGER	2	x0
P17.1.5	547	1803	0	161	1	132	177	1	5	OverCurrent Bypass Enable	BOOLEAN	1	x0
P17.1.6	546	1803	1	161	1	133	177	1	6	IGBT Fault Bypas Enable	BOOLEAN	1	x0
P17.1.7	548	1803	2	161	1	134	177	1	7	4mA Fault Bypass Enable	BOOLEAN	1	x0
P17.1.8	545	1803	3	161	1	135	177	1	8	UnderVoltage Bypass Enable	BOOLEAN	1	x0
P17.1.9	549	1803	4	161	1	136	177	1	9	OverVoltage Bypass Enable	BOOLEAN	1	x0
P17.2.1	2476	NA	NA	NA	NA	NA	NA	NA	NA	Redundant Drive Enable	BYTE	1	x0
P17.2.2	2278	NA	NA	165	1	56	NA	NA	NA	Drive ID	BYTE	1	x0
P17.2.3	2477	NA	NA	NA	NA	NA	NA	NA	NA	Redundant Run Time Enable	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P17.2.4	2478	NA	NA	NA	NA	NA	NA	NA	NA	Redundant Run Time Reset	BYTE	1	x0
P17.2.5	2479	NA	NA	NA	NA	NA	NA	NA	NA	Redundant RunTime Limit	DOUBLE	4	x10
P18.1.1	2279	NA	NA	165	1	57	NA	NA	NA	Multi-pump Mode	BYTE	1	x0
P18.1.2	2278	NA	NA	165	1	56	NA	NA	NA	Drive ID	BYTE	1	x0
P18.1.3	2458	NA	NA	NA	NA	NA	NA	NA	NA	PID Bandwidth	DOUBLE	4	x100
P18.1.4	2315	NA	NA	165	1	81	NA	NA	NA	Staging Frequency	INTEGER	2	x100
P18.1.5	2316	NA	NA	165	1	82	NA	NA	NA	De-Staging Frequency	INTEGER	2	x100
P18.1.6	344	1923	0	161	1	139	178	1	3	Add/Remove Delay	INTEGER	2	x0
P18.1.7	350	1909	0	161	1	140	178	1	4	Interlock Enable	BYTE	1	x0
P18.1.8	483	636	0	160	1	47	178	1	10	Damper Start	BYTE	1	x0
P18.1.9	484	118	0	160	1	48	178	1	11	Damper Time Out	INTEGER	2	x0
P18.1.10	485	118	1	160	1	49	178	1	12	Damper Delay	INTEGER	2	x0
P18.1.11	2468	NA	NA	NA	NA	NA	NA	NA	NA	Derag Cycles	BYTE	1	x0
P18.1.12	2469	NA	NA	NA	NA	NA	NA	NA	NA	Derag at Start/Stop	BYTE	1	x0
P18.1.13	2470	NA	NA	NA	NA	NA	NA	NA	NA	Deragging Run Time	INTEGER	2	x0
P18.1.14	2471	NA	NA	NA	NA	NA	NA	NA	NA	Derag Speed	INTEGER	2	x100
P18.1.15	2472	NA	NA	NA	NA	NA	NA	NA	NA	Derag Off Delay	INTEGER	2	x0
P18.2.1.1	2218	NA	NA	165	1	1	NA	NA	NA	Drive 1	BYTE	1	x0
P18.2.1.2	2230	NA	NA	165	1	12	NA	NA	NA	Drive 2	BYTE	1	x0
P18.2.1.3	2242	NA	NA	165	1	23	NA	NA	NA	Drive 3	BYTE	1	x0
P18.2.1.4	2254	NA	NA	165	1	34	NA	NA	NA	Drive 4	BYTE	1	x0
P18.2.1.5	2266	NA	NA	165	1	45	NA	NA	NA	Drive 5	BYTE	1	x0
P18.2.2.1	2219	NA	NA	165	1	2	NA	NA	NA	Drive 1	BYTE	1	x0
P18.2.2.2	2231	NA	NA	165	1	13	NA	NA	NA	Drive 2	BYTE	1	x0
P18.2.2.3	2243	NA	NA	165	1	24	NA	NA	NA	Drive 3	BYTE	1	x0
P18.2.2.4	2255	NA	NA	165	1	35	NA	NA	NA	Drive 4	BYTE	1	x0
P18.2.2.5	2267	NA	NA	165	1	46	NA	NA	NA	Drive 5	BYTE	1	x0
P18.2.3.1	2220	NA	NA	165	1	3	NA	NA	NA	Drive 1	BYTE	1	x0
P18.2.3.2	2232	NA	NA	165	1	14	NA	NA	NA	Drive 2	BYTE	1	x0
P18.2.3.3	2244	NA	NA	165	1	25	NA	NA	NA	Drive 3	BYTE	1	x0
P18.2.3.4	2256	NA	NA	165	1	36	NA	NA	NA	Drive 4	BYTE	1	x0
P18.2.3.5	2268	NA	NA	165	1	47	NA	NA	NA	Drive 5	BYTE	1	x0
P18.3.1.1	2221	NA	NA	165	1	4	NA	NA	NA	Drive 1	BYTE	1	x0
P18.3.1.2	2233	NA	NA	165	1	15	NA	NA	NA	Drive 2	BYTE	1	x0
P18.3.1.3	2245	NA	NA	165	1	26	NA	NA	NA	Drive 3	BYTE	1	x0
P18.3.1.4	2257	NA	NA	165	1	37	NA	NA	NA	Drive 4	BYTE	1	x0
P18.3.1.5	2269	NA	NA	165	1	48	NA	NA	NA	Drive 5	BYTE	1	x0
P18.3.2.1	2222	NA	NA	165	1	5	NA	NA	NA	Drive 1	INTEGER	2	x100
P18.3.2.2	2234	NA	NA	165	1	16	NA	NA	NA	Drive 2	INTEGER	2	x100
P18.3.2.3	2246	NA	NA	165	1	27	NA	NA	NA	Drive 3	INTEGER	2	x100
P18.3.2.4	2258	NA	NA	165	1	38	NA	NA	NA	Drive 4	INTEGER	2	x100
P18.3.2.5	2270	NA	NA	165	1	49	NA	NA	NA	Drive 5	INTEGER	2	x100
P18.3.3.1	2223	NA	NA	165	1	6	NA	NA	NA	Drive 1	INTEGER	2	x10
P18.3.3.2	2235	NA	NA	165	1	17	NA	NA	NA	Drive 2	INTEGER	2	x10
P18.3.3.3	2247	NA	NA	165	1	28	NA	NA	NA	Drive 3	INTEGER	2	x10
P18.3.3.4	2259	NA	NA	165	1	39	NA	NA	NA	Drive 4	INTEGER	2	x10
P18.3.3.5	2271	NA	NA	165	1	50	NA	NA	NA	Drive 5	INTEGER	2	x10
P18.3.4.1	2224	NA	NA	165	1	7	NA	NA	NA	Drive 1	INTEGER	2	x10

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P18.3.4.2	2236	NA	NA	165	1	18	NA	NA	NA	Drive 2	INTEGER	2	x10
P18.3.4.3	2248	NA	NA	165	1	29	NA	NA	NA	Drive 3	INTEGER	2	x10
P18.3.4.4	2260	NA	NA	165	1	40	NA	NA	NA	Drive 4	INTEGER	2	x10
P18.3.4.5	2272	NA	NA	165	1	51	NA	NA	NA	Drive 5	INTEGER	2	x10
P18.3.5.1	2225	NA	NA	165	1	8	NA	NA	NA	Drive 1	INTEGER	2	x10
P18.3.5.2	2237	NA	NA	165	1	19	NA	NA	NA	Drive 2	INTEGER	2	x10
P18.3.5.3	2249	NA	NA	165	1	30	NA	NA	NA	Drive 3	INTEGER	2	x10
P18.3.5.4	2261	NA	NA	165	1	41	NA	NA	NA	Drive 4	INTEGER	2	x10
P18.3.5.5	2273	NA	NA	165	1	52	NA	NA	NA	Drive 5	INTEGER	2	x10
P18.3.6.1	2226	NA	NA	165	1	9	NA	NA	NA	Drive 1	INTEGER	2	x10
P18.3.6.2	2238	NA	NA	165	1	20	NA	NA	NA	Drive 2	INTEGER	2	x10
P18.3.6.3	2250	NA	NA	165	1	31	NA	NA	NA	Drive 3	INTEGER	2	x10
P18.3.6.4	2262	NA	NA	165	1	42	NA	NA	NA	Drive 4	INTEGER	2	x10
P18.3.6.5	2274	NA	NA	165	1	53	NA	NA	NA	Drive 5	INTEGER	2	x10
P18.3.7.1	2227	NA	NA	165	1	10	NA	NA	NA	Drive 1	INTEGER	2	x0
P18.3.7.2	2239	NA	NA	165	1	21	NA	NA	NA	Drive 2	INTEGER	2	x0
P18.3.7.3	2251	NA	NA	165	1	32	NA	NA	NA	Drive 3	INTEGER	2	x0
P18.3.7.4	2263	NA	NA	165	1	43	NA	NA	NA	Drive 4	INTEGER	2	x0
P18.3.7.5	2275	NA	NA	165	1	54	NA	NA	NA	Drive 5	INTEGER	2	x0
P18.3.8.1	2228	NA	NA	165	1	11	NA	NA	NA	Drive 1	DOUBLE	4	x10
P18.3.8.2	2240	NA	NA	165	1	22	NA	NA	NA	Drive 2	DOUBLE	4	x10
P18.3.8.3	2252	NA	NA	165	1	33	NA	NA	NA	Drive 3	DOUBLE	4	x10
P18.3.8.4	2264	NA	NA	165	1	44	NA	NA	NA	Drive 4	DOUBLE	4	x10
P18.3.8.5	2276	NA	NA	165	1	55	NA	NA	NA	Drive 5	DOUBLE	4	x10
P18.4.1	342	1906	0	161	1	137	178	1	1	Number of Pumps	BYTE	1	x0
P18.4.2	346	1904	0	161	1	141	178	1	5	Include Freq Converter	BYTE	1	x0
P18.4.3	345	1900	0	161	1	142	178	1	6	Auto-Change Enable	BOOLEAN	1	x0
P18.4.4	347	1901	0	161	1	143	178	1	7	Auto-Change Interval	INTEGER	2	x10
P18.4.5	349	1902	0	161	1	144	178	1	8	Auto-Change Freq Limit	INTEGER	2	x100
P18.4.6	348	1903	0	161	1	145	178	1	9	Auto-Change Pump Limit	BYTE	1	x0
P18.4.7	2439	NA	NA	NA	NA	NA	NA	NA	NA	Pipe Fill Aux Pump Select	BYTE	1	x0
P18.4.8	2440	NA	NA	NA	NA	NA	NA	NA	NA	Pipe Fill Aux Pump Run Time	INTEGER	2	x10
P18.4.9	2441	NA	NA	NA	NA	NA	NA	NA	NA	Pipe Fill Aux Pump Operation	BYTE	1	x0
P18.4.10	2442	NA	NA	NA	NA	NA	NA	NA	NA	Pipe Fill Aux Pump Delay	INTEGER	2	x10
P18.5.1	2449	NA	NA	NA	NA	NA	NA	NA	NA	Number of Drives	BYTE	1	x0
P18.5.2	2284	NA	NA	165	1	61	NA	NA	NA	Regulation Source	BYTE	1	x0
P18.5.3	2285	NA	NA	165	1	62	NA	NA	NA	Recovery Method	BYTE	1	x0
P18.5.4	2286	NA	NA	165	1	63	NA	NA	NA	Callback Source	BYTE	1	x0
P18.5.5	2311	NA	NA	165	1	80	NA	NA	NA	Add/Remove Drive Selection	BYTE	1	x0
P18.5.6	2280	NA	NA	165	1	58	NA	NA	NA	Run Time Enable	BYTE	1	x0
P18.5.7	2281	NA	NA	165	1	59	NA	NA	NA	Run Time Limit	DOUBLE	4	x10
P18.5.8	2283	NA	NA	165	1	60	NA	NA	NA	Run Time Reset	BYTE	1	x0
P18.5.9	2473	NA	NA	NA	NA	NA	NA	NA	NA	Master Drive Mode	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P18.5.10	2474	NA	NA	NA	NA	NA	NA	NA	NA	Master Fixed Speed	INTEGER	2	x100
P18.5.11	2475	NA	NA	NA	NA	NA	NA	NA	NA	Master Fixed Speed Delay	INTEGER	2	x0
P18.6.1	2406	NA	NA	NA	NA	NA	NA	NA	NA	Pipe Fill Loss Detection Method	BYTE	1	x0
P18.6.2	2407	NA	NA	NA	NA	NA	NA	NA	NA	Pipe Fill Loss Level	INTEGER	2	x10
P18.6.3	2408	NA	NA	NA	NA	NA	NA	NA	NA	Pipe Fill Loss Time	INTEGER	2	x0
P18.6.4	2409	NA	NA	NA	NA	NA	NA	NA	NA	Pipe Fill Loss Frequency	INTEGER	2	x100
P18.6.5	2410	NA	NA	NA	NA	NA	NA	NA	NA	Pipe Fill Loss Response	BYTE	1	x0
P18.6.6	2411	NA	NA	NA	NA	NA	NA	NA	NA	Pipe Fill Loss Attempts	BYTE	1	x0
P18.6.7	2428	NA	NA	NA	NA	NA	NA	NA	NA	Prime Pump Enable	BYTE	1	x0
P18.6.8	2429	NA	NA	NA	NA	NA	NA	NA	NA	Prime Pump Level	DOUBLE	4	x100
P18.6.9	2431	NA	NA	NA	NA	NA	NA	NA	NA	Prime Pump Frequency	INTEGER	2	x100
P18.6.10	2432	NA	NA	NA	NA	NA	NA	NA	NA	Prime Pump Delay Time	INTEGER	2	x10
P18.6.11	2433	NA	NA	NA	NA	NA	NA	NA	NA	Prime Pump Loss of Prime Level	INTEGER	2	x10
P18.6.12	2434	NA	NA	NA	NA	NA	NA	NA	NA	Prime Pump Level 2	DOUBLE	4	x100
P18.6.13	2436	NA	NA	NA	NA	NA	NA	NA	NA	Prime Pump Frequency 2	INTEGER	2	x100
P18.6.14	2437	NA	NA	NA	NA	NA	NA	NA	NA	Prime Pump Delay Time 2	INTEGER	2	x10
P18.6.15	2438	NA	NA	NA	NA	NA	NA	NA	NA	Prime Pump Loss of Prime Level 2	INTEGER	2	x10
P19.1	491	NA	NA	161	1	146	179	1	1	Interval 1 On Time	BYTE	3	x0
P19.2	493	NA	NA	161	1	147	179	1	2	Interval 1 Off Time	BYTE	3	x0
P19.3	517	3122	0	161	1	148	179	1	3	Interval 1 From Day	BYTE	1	x0
P19.4	518	3123	0	161	1	149	179	1	4	Interval 1 To Day	BYTE	1	x0
P19.5	519	3124	0	161	1	150	179	1	5	Interval 1 Channel	BYTE	1	x0
P19.6	495	NA	NA	161	1	151	179	1	6	Interval 2 On Time	BYTE	3	x0
P19.7	497	NA	NA	161	1	152	179	1	7	Interval 2 Off Time	BYTE	3	x0
P19.8	520	3122	1	161	1	153	179	1	8	Interval 2 From Day	BYTE	1	x0
P19.9	521	3123	1	161	1	154	179	1	9	Interval 2 To Day	BYTE	1	x0
P19.10	522	3124	1	161	1	155	179	1	10	Interval 2 Channel	BYTE	1	x0
P19.11	499	NA	NA	161	1	156	179	1	11	Interval 3 On Time	BYTE	3	x0
P19.12	501	NA	NA	161	1	157	179	1	12	Interval 3 Off Time	BYTE	3	x0
P19.13	523	3122	2	161	1	158	179	1	13	Interval 3 From Day	BYTE	1	x0
P19.14	524	3123	2	161	1	159	179	1	14	Interval 3 To Day	BYTE	1	x0
P19.15	525	3124	2	161	1	160	179	1	15	Interval 3 Channel	BYTE	1	x0
P19.16	503	NA	NA	161	1	161	179	1	16	Interval 4 On Time	BYTE	3	x0
P19.17	505	NA	NA	161	1	162	179	1	17	Interval 4 Off Time	BYTE	3	x0
P19.18	526	3122	3	161	1	163	179	1	18	Interval 4 From Day	BYTE	1	x0
P19.19	527	3123	3	161	1	164	179	1	19	Interval 4 To Day	BYTE	1	x0
P19.20	528	3124	3	161	1	165	179	1	20	Interval 4 Channel	BYTE	1	x0
P19.21	507	NA	NA	161	1	166	179	1	21	Interval 5 On Time	BYTE	3	x0
P19.22	509	NA	NA	161	1	167	179	1	22	Interval 5 Off Time	BYTE	3	x0
P19.23	529	3122	4	161	1	168	179	1	23	Interval 5 From Day	BYTE	1	x0
P19.24	530	3123	4	161	1	169	179	1	24	Interval 5 To Day	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P19.25	531	3124	4	161	1	170	179	1	25	Interval 5 Channel	BYTE	1	x0
P19.26	511	3100	0	161	1	171	179	1	26	Timer 1 Duration	DOUBLE	4	x0
P19.27	532	3102	0	161	1	172	179	1	27	Timer 1 Channel	BYTE	1	x0
P19.28	513	3100	1	161	1	173	179	1	28	Timer 2 Duration	DOUBLE	4	x0
P19.29	533	3102	1	161	1	174	179	1	29	Timer 2 Channel	BYTE	1	x0
P19.30	515	3100	2	161	1	175	179	1	30	Timer 3 Duration	DOUBLE	4	x0
P19.31	534	3102	2	161	1	176	179	1	31	Timer 3 Channel	BYTE	1	x0
P19.32	2487	NA	NA	NA	NA	NA	NA	NA	NA	Interval 1 Setting	BYTE	1	x0
P19.33	2488	NA	NA	NA	NA	NA	NA	NA	NA	Interval 2 Setting	BYTE	1	x0
P19.34	2489	NA	NA	NA	NA	NA	NA	NA	NA	Interval 3 Setting	BYTE	1	x0
P19.35	2490	NA	NA	NA	NA	NA	NA	NA	NA	Interval 4 Setting	BYTE	1	x0
P19.36	2491	NA	NA	NA	NA	NA	NA	NA	NA	Interval 5 Setting	BYTE	1	x0
P20.1.1	2533	NA	NA	NA	NA	NA	NA	NA	NA	FB Process Data Input 1 Sel	INTEGER	2	x0
P20.1.2	2534	NA	NA	NA	NA	NA	NA	NA	NA	FB Process Data Input 2 Sel	INTEGER	2	x0
P20.1.3	2535	NA	NA	NA	NA	NA	NA	NA	NA	FB Process Data Input 3 Sel	INTEGER	2	x0
P20.1.4	2536	NA	NA	NA	NA	NA	NA	NA	NA	FB Process Data Input 4 Sel	INTEGER	2	x0
P20.1.5	2537	NA	NA	NA	NA	NA	NA	NA	NA	FB Process Data Input 5 Sel	INTEGER	2	x0
P20.1.6	2538	NA	NA	NA	NA	NA	NA	NA	NA	FB Process Data Input 6 Sel	INTEGER	2	x0
P20.1.7	2539	NA	NA	NA	NA	NA	NA	NA	NA	FB Process Data Input 7 Sel	INTEGER	2	x0
P20.1.8	2540	NA	NA	NA	NA	NA	NA	NA	NA	FB Process Data Input 8 Sel	INTEGER	2	x0
P20.2.1	1556	442	0	163	1	179	180	1	1	FB Process Data Output 1 Sel	INTEGER	2	x0
P20.2.2	1557	442	1	163	1	180	180	1	2	FB Process Data Output 2 Sel	INTEGER	2	x0
P20.2.3	1558	442	2	163	1	181	180	1	3	FB Process Data Output 3 Sel	INTEGER	2	x0
P20.2.4	1559	442	3	163	1	182	180	1	4	FB Process Data Output 4 Sel	INTEGER	2	x0
P20.2.5	1560	442	4	163	1	183	180	1	5	FB Process Data Output 5 Sel	INTEGER	2	x0
P20.2.6	1561	442	5	163	1	184	180	1	6	FB Process Data Output 6 Sel	INTEGER	2	x0
P20.2.7	1562	442	6	163	1	185	180	1	7	FB Process Data Output 7 Sel	INTEGER	2	x0
P20.2.8	1563	442	7	163	1	186	180	1	8	FB Process Data Output 8 Sel	INTEGER	2	x0
P20.2.9	2415	NA	NA	NA	NA	NA	NA	NA	NA	Standard Status Word Bit0 Function Select	BYTE	1	x0
P20.2.10	2416	NA	NA	NA	NA	NA	NA	NA	NA	Standard Status Word Bit1 Function Select	BYTE	1	x0
P20.2.11	2417	NA	NA	NA	NA	NA	NA	NA	NA	Standard Status Word Bit2 Function Select	BYTE	1	x0
P20.2.12	2418	NA	NA	NA	NA	NA	NA	NA	NA	Standard Status Word Bit3 Function Select	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
P20.2.13	2419	NA	NA	NA	NA	NA	NA	NA	NA	Standard Status Word Bit4 Function Select	BYTE	1	x0
P20.2.14	2420	NA	NA	NA	NA	NA	NA	NA	NA	Standard Status Word Bit5 Function Select	BYTE	1	x0
P20.2.15	2421	NA	NA	NA	NA	NA	NA	NA	NA	Standard Status Word Bit6 Function Select	BYTE	1	x0
P20.2.16	2422	NA	NA	NA	NA	NA	NA	NA	NA	Standard Status Word Bit7 Function Select	BYTE	1	x0
P20.3.1.1	586	3220	0	161	1	192	181	1	1	RS485 Comm Set	BYTE	1	x0
P20.3.2.1	587	3221	0	161	1	193	181	1	2	Slave Address	BYTE	1	x0
P20.3.2.2	584	3222	0	161	1	194	181	1	3	Baud Rate	BYTE	1	x0
P20.3.2.3	585	3224	0	161	1	195	181	1	4	Parity Type	BYTE	1	x0
P20.3.2.4	588	3225	0	161	1	196	181	1	5	Modbus RTU Protocol Status	BYTE	1	x0
P20.3.2.5	589	3226	0	161	1	197	181	1	6	Slave Busy	BOOLEAN	1	x0
P20.3.2.6	590	3227	0	161	1	198	181	1	7	Parity Error	BYTE	1	x0
P20.3.2.7	591	3228	0	161	1	199	181	1	8	Slave Fault	BYTE	1	x0
P20.3.2.8	592	3229	0	161	1	200	181	1	9	Last Fault Response	BYTE	1	x0
P20.3.2.9	593	3290	0	161	1	201	181	1	10	Comm Timeout Modbus RTU	INTEGER	2	x0
P20.3.2.10	2516	NA	NA	NA	NA	NA	NA	NA	NA	Modbus RTU Fault Response	BYTE	1	x0
P20.3.3.1	594	3232	0	161	1	202	181	1	11	MSTP Baud Rate	BYTE	1	x0
P20.3.3.2	595	3272	0	161	1	203	181	1	12	MSTP MS/TP Device Address	BYTE	1	x0
P20.3.3.3	596	3270	0	161	1	204	181	1	13	MSTP Instance Number	DOUBLE	4	x0
P20.3.3.4	598	3273	0	161	1	205	181	1	14	MSTP Comm Timeout MSTP	INTEGER	2	x0
P20.3.3.5	599	3265	0	161	1	206	181	1	15	MSTP Protocol Status	BYTE	1	x0
P20.3.3.6	600	3274	0	161	1	207	181	1	16	MSTP Fault Code	BYTE	1	x0
P20.3.3.7	2526	NA	NA	NA	NA	NA	NA	NA	NA	MSTP Fault Response	BYTE	1	x0
P20.3.3.8	1537	NA	NA	163	1	143	NA	NA	NA	MSTP Max Master	BYTE	1	x0
P20.4.1	1500	3249	0	161	1	208	182	1	1	IP Address Mode	BOOLEAN	1	x0
P20.4.2	1507	3246	0	161	1	209	182	1	2	Active IP Address	BYTE	4	x0
P20.4.3	1509	3247	0	161	1	210	182	1	3	Active Subnet Mask	BYTE	4	x0
P20.4.4	1511	3248	0	161	1	211	182	1	4	Active Default Gateway	BYTE	4	x0
P20.4.5	1513	3333	0	161	1	212	182	1	5	MAC Address	BYTE	6	x0
P20.4.6	1501	3243	0	162	1	139	182	1	6	Static IP Address	BYTE	4	x0
P20.4.7	1503	3244	0	162	1	140	182	1	7	Static Subnet Mask	BYTE	4	x0
P20.4.8	1505	3245	0	162	1	141	182	1	8	Static Default Gateway	BYTE	4	x0
P20.4.9	608	NA	NA	164	1	54	182	1	9	Ethernet IP Protocol Status	BYTE	1	x0
P20.4.10	2518	NA	NA	NA	NA	NA	NA	NA	NA	EIP Fault Response	BYTE	1	x0
P20.5.1	609	NA	NA	161	1	213	182	1	10	Connection Limit	BYTE	1	x0
P20.5.2	610	NA	NA	161	1	214	182	1	11	Modbus TCP Unit ID	BYTE	1	x0
P20.5.3	611	NA	NA	41	1	109	182	1	12	Comm Timeout Modbus TCP	INTEGER	2	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
P20.5.4	612	3235	0	161	1	216	182	1	13	Modbus TCP Protocol Status	BYTE	1	x0
P20.5.5	613	3236	0	161	1	217	182	1	14	Slave Busy	BYTE	1	x0
P20.5.6	614	3237	0	161	1	218	182	1	15	Parity Error	BYTE	1	x0
P20.5.7	615	3238	0	161	1	219	182	1	16	Slave Failure	BYTE	1	x0
P20.5.8	616	3239	0	161	1	220	182	1	17	Last Fault Response	BYTE	1	x0
P20.5.9	2517	NA	NA	NA	NA	NA	NA	NA	NA	Modbus TCP Fault Response	BYTE	1	x0
P21.1.1	340	323	0	162	1	21	183	1	1	Language	BYTE	1	x0
P21.1.2	142	256	0	160	1	46	183	1	2	Application	BYTE	1	x0
P21.1.3	619	970	0	162	1	22	183	1	3	Parameter Sets	BYTE	1	x0
P21.1.4	620	302	0	162	1	23	183	1	4	Up To Keypad	BOOLEAN	1	x0
P21.1.5	621	302	1	162	1	24	183	1	5	Down From Keypad	BYTE	1	x0
P21.1.6	623	305	0	162	1	26	183	1	6	Parameter Comparison	BYTE	1	x0
P21.1.7	624	320	0	162	1	27	183	1	7	Password	INTEGER	2	x0
P21.1.8	625	625	0	162	1	28	183	1	8	Parameter Lock	BOOLEAN	1	x0
P21.1.9	627	328	0	162	1	30	183	1	9	Multimonitor Set	BOOLEAN	1	x0
P21.1.10	628	326	0	162	1	31	183	1	10	Default Page	BYTE	1	x0
P21.1.11	629	330	0	162	1	32	183	1	11	Timeout Time	INTEGER	2	x0
P21.1.12	630	324	0	162	1	33	183	1	12	Contrast Adjust	BYTE	1	x0
P21.1.13	631	330	1	162	1	34	183	1	13	Backlight Time	INTEGER	2	x0
P21.1.14	632	627	0	162	1	35	183	1	14	Fan Control	BYTE	1	x0
P21.1.15	633	362	0	162	1	36	183	1	15	Keypad ACK Timeout	INTEGER	2	x0
P21.1.16	634	3291	0	162	1	37	183	1	16	Keypad Retry Number	BYTE	1	x0
P21.1.17	626	NA	NA	162	1	29	NA	NA	NA	Startup Wizard	BOOLEAN	1	x0
P21.1.18	2412	NA	NA	NA	NA	NA	NA	NA	NA	Jog Softkey Hidden	BYTE	1	x0
P21.1.19	2413	NA	NA	NA	NA	NA	NA	NA	NA	Reverse Softkey Hidden	BYTE	1	x0
P21.1.20	2424	NA	NA	NA	NA	NA	NA	NA	NA	Output Display Unit	BYTE	1	x0
P21.1.21	2460	NA	NA	NA	NA	NA	NA	NA	NA	Output Display Unit Min	DOUBLE	4	x100
P21.1.22	2425	NA	NA	NA	NA	NA	NA	NA	NA	Output Display Unit Max	DOUBLE	4	x100
P21.2.1	640	207	2	161	1	255	184	1	1	Keypad Software Version	INTEGER	4	x0
P21.2.2	642	206	0	162	1	1	184	1	2	Motor Control Software Version	INTEGER	4	x0
P21.2.3	644	207	1	1	1	4	184	1	3	Application Software Version	INTEGER	4	x0
P21.2.4	1714	NA	NA	NA	NA	NA	NA	NA	NA	Software Bundle Version		20	x0
P21.3.1	646	2206	0	162	1	9	184	1	4	Brake Chopper	BOOLEAN	1	x0
P21.3.2	647	2200	0	162	1	10	184	1	5	Brake Resistor Status	BOOLEAN	1	x0
P21.3.3	648	209	0	162	1	8	184	1	6	Serial Number	DOUBLE	4	x0
P21.4.1	566	3000	0	160	1	21	185	1	1	Real Time Clock	BYTE	6	x0
P21.4.2	582	3001	0	162	1	12	185	1	2	Daylight Saving	BYTE	1	x0
P21.4.3	601	520	2	162	1	13	185	1	3	Total MWh Count	DOUBLE	4	x10000
P21.4.4	603	522	0	162	1	14	185	1	4	Total Power Day Count	INTEGER	2	x0
P21.4.5	606	821	1	162	1	15	185	1	5	Total Power Hr Count	DOUBLE	4	x0
P21.4.6	604	806	0	162	1	16	185	1	6	Trip MWh Count	DOUBLE	4	x10000

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
P21.4.7	635	322	3	162	1	17	185	1	7	Clear Trip MWh Count	BOOLEAN	1	x0
P21.4.8	636	870	0	162	1	18	185	1	8	Trip Power Day Count	INTEGER	2	x0
P21.4.9	637	871	0	162	1	19	185	1	9	Trip Power Hr Count	DOUBLE	4	x0
P21.4.10	639	322	4	162	1	20	185	1	10	Clear Trip Power Count	BOOLEAN	1	x0
B2.1.1	883	710	1	162	1	151	186	1	1	Board Status	BYTE	1	x0
B2.1.2	1064	NA	NA	162	1	154	NA	NA	NA	Firmware Version	INTEGER	4	x0
B2.1.3	889	760	3	162	1	160	186	1	2	DI1, DI2, DI3	BYTE	1	x0
B2.1.4	888	761	3	162	1	159	186	1	3	DO1, DO2, DO3	BYTE	1	x0
B2.1.5	891	593	100	162	1	162	186	1	4	Thermistor Resistor	DOUBLE	4	x0
B2.1.6	887	753	100	162	1	158	186	1	5	Thermistor State	BYTE	1	x0
B2.2.1	241	461	100	162	1	155	186	1	6	DO1 Function	BYTE	1	x0
B2.2.2	242	461	101	162	1	156	186	1	7	DO2 Function	BYTE	1	x0
B2.2.3	243	461	102	162	1	157	186	1	8	DO3 Function	BYTE	1	x0
B2.2.4	890	343	100	162	1	161	186	1	9	Thermistor Config	BOOLEAN	1	x0
B3.1.1	883	710	1	162	1	151	186	1	1	Board Status	BYTE	1	x0
B3.1.2	1064	NA	NA	162	1	154	NA	NA	NA	Firmware Version	INTEGER	4	x0
B3.1.3	894	560	100	162	1	181	186	1	11	AI1 Value	INTEGER	2	x1000
B3.1.4	897	570	100	162	1	184	186	1	12	AO1 Value	INTEGER	2	x1000
B3.1.5	899	570	101	162	1	186	186	1	13	AO2 Value	INTEGER	2	x1000
B3.2.1	893	263	100	162	1	180	186	1	14	AI1 Mode	BYTE	1	x0
B3.2.2	124	260	100	162	1	164	186	1	15	AI1 Signal Range	BYTE	1	x0
B3.2.3	125	264	100	162	1	165	186	1	16	AI1 Custom Min	INTEGER	2	x100
B3.2.4	126	265	100	162	1	166	186	1	17	AI1 Custom Max	INTEGER	2	x100
B3.2.5	123	266	100	162	1	179	186	1	18	AI1 Filter Time	INTEGER	2	x100
B3.2.6	127	267	100	162	1	163	186	1	19	AI1 Signal Invert	BOOLEAN	1	x0
B3.2.7	896	276	100	162	1	183	186	1	20	AO1 Mode	BYTE	1	x0
B3.2.8	235	460	100	162	1	167	186	1	21	AO1 Function	BYTE	1	x0
B3.2.9	238	279	100	162	1	168	186	1	22	AO1 Minimum	BYTE	1	x0
B3.2.10	236	277	100	162	1	169	186	1	23	AO1 Filter Time	INTEGER	2	x100
B3.2.11	239	274	100	162	1	170	186	1	24	AO1 Scale	INTEGER	2	x0
B3.2.12	237	278	100	162	1	171	186	1	25	AO1 Inversion	BOOLEAN	1	x0
B3.2.13	240	275	100	162	1	172	186	1	26	AO1 Offset	INTEGER	2	x100
B3.2.14	898	276	101	162	1	185	186	1	27	AO2 Mode	BYTE	1	x0
B3.2.15	269	460	101	162	1	173	186	1	28	AO2 Function	BYTE	1	x0
B3.2.16	270	279	101	162	1	174	186	1	29	AO2 Minimum	BYTE	1	x0
B3.2.17	271	277	101	162	1	175	186	1	30	AO2 Filter Time	INTEGER	2	x100
B3.2.18	272	274	101	162	1	176	186	1	31	AO2 Scale	INTEGER	2	x0
B3.2.19	273	278	101	162	1	177	186	1	32	AO2 Inversion	BOOLEAN	1	x0
B3.2.20	274	275	101	162	1	178	186	1	33	AO2 Offset	INTEGER	2	x100
B4.1.1	883	710	1	162	1	151	186	1	1	Board Status	BYTE	1	x0
B4.1.2	1064	NA	NA	162	1	154	NA	NA	NA	Firmware Version	INTEGER	4	x0
B4.1.3	900	455	100	162	1	190	186	1	35	RO1, RO2, RO3	BYTE	1	x0
B4.2.1	540	451	100	162	1	187	186	1	36	RO1 Function	BYTE	1	x0
B4.2.2	541	451	101	162	1	188	186	1	37	RO2 Function	BYTE	1	x0
B4.2.3	551	451	102	162	1	189	186	1	38	RO3 Function	BYTE	1	x0
B5.1.1	883	710	1	162	1	151	186	1	1	Board Status	BYTE	1	x0
B5.1.2	1064	NA	NA	162	1	154	NA	NA	NA	Firmware Version	INTEGER	4	x0
B5.1.3	905	756	100	162	1	195	186	1	40	PT100 State	INTEGER	6	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
B5.1.4	902	NA	NA	162	1	194	186	1	41	PT100 Values	INTEGER	6	x10
B5.2.1	901	342	100	162	1	191	186	1	42	PT100-3,2,1	BYTE	1	x0
B5.2.2	338	581	100	162	1	192	186	1	43	PT100 Warning Limit	INTEGER	2	x10
B5.2.3	339	582	100	162	1	193	186	1	44	PT100 Fault Limit	INTEGER	2	x10
B6.1.1	883	710	1	162	1	151	186	1	1	Board Status	BYTE	1	x0
B6.1.2	1064	NA	NA	162	1	154	NA	NA	NA	Firmware Version	INTEGER	4	x0
B6.1.3	908	760	3	162	1	196	186	1	46	AC1, AC2, AC3	BYTE	1	x0
B6.1.4	1696	760	7	162	1	197	186	1	47	AC4, AC5, AC6	BYTE	1	x0
B7.1.1.1	883	710	1	162	1	151	186	1	1	Board Status	BYTE	1	x0
B7.1.1.2	1064	NA	NA	162	1	154	NA	NA	NA	Firmware Version	INTEGER	4	x0
B7.1.1.3	2131	NA	NA	164	1	90	NA	NA	NA	Protocol Status	BYTE	1	x0
B7.1.1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Telegram Selection	INTEGER	2	x0
B7.1.1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Fault Counter PDP	INTEGER	2	x0
B7.1.1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	Fault Situations Max	INTEGER	4	x0
B7.1.1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Profil Number	INTEGER	2	x0
B7.1.1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Control Word	INTEGER	2	x0
B7.1.1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Status Word	INTEGER	2	x0
B7.1.2.1	2621	NA	NA	NA	NA	NA	NA	NA	NA	PDP-MaxBlockLength	BYTE	1	x0
B7.1.2.2	2622	NA	NA	NA	NA	NA	NA	NA	NA	PDP-NoOfMultiparameter	BYTE	1	x0
B7.1.2.3	2623	NA	NA	NA	NA	NA	NA	NA	NA	PDP-MaxLatency	BYTE	1	x0
B7.1.3.1	2624	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO Manufacturer	INTEGER	2	x0
B7.1.3.2	1451	NA	NA	1	1	3	150	1	4	PDP-DO Device Type			
B7.1.3.3	2625	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO FW-Interface	INTEGER	2	x0
B7.1.3.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO FW-Year	INTEGER	2	x0
B7.1.3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO FW-DayMonth	INTEGER	2	x0
B7.1.3.6	2628	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO NoOfDOs	INTEGER	2	x0
B7.1.3.7	2629	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO Subclass	BYTE	1	x0
B7.2.1	1242	3201	100	163	1	116	NA	NA	NA	Slave Address	BYTE	1	x0
B7.2.2	1243	3202	100	163	1	117	NA	NA	NA	Baud Rate	BYTE	1	x0
B7.2.3	1245	3200	100	163	1	119	NA	NA	NA	Operate Mode	BYTE	1	x0
B7.2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	Parameter Access	INTEGER	2	x0
B7.2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Process Data Access	INTEGER	2	x0
B7.2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	Fault Situation Counter	INTEGER	2	x0
B7.2.7	619	970	0	162	1	22	183	1	3	Parameter Sets	BYTE	1	x0
B8.1.1	883	710	1	162	1	151	186	1	1	Board Status	BYTE	1	x0
B8.1.2	1064	NA	NA	162	1	154	NA	NA	NA	Firmware Version	INTEGER	4	x0
B8.1.3	2132	NA	NA	164	1	91	NA	NA	NA	Protocol Status	BYTE	1	x0
B8.2.1	2133	NA	NA	164	1	92	NA	NA	NA	Node ID	BYTE	1	x0
B8.2.2	2134	NA	NA	164	1	93	NA	NA	NA	Baud Rate	BYTE	1	x0
B8.2.3	2135	NA	NA	164	1	94	NA	NA	NA	Operate Mode	BYTE	1	x0
B8.2.4	2519	NA	NA	NA	NA	NA	NA	NA	NA	Comm Card FB Fault Response	BYTE	1	x0
B9.1.1	883	710	1	162	1	151	186	1	1	Board Status	BYTE	1	x0
B9.1.2	1064	NA	NA	162	1	154	NA	NA	NA	Firmware Version	INTEGER	4	x0
B9.1.3	2136	NA	NA	164	1	95	187	1	2	Protocol Status	BYTE	1	x0
B9.2.1	2137	NA	NA	164	1	96	187	1	3	MAC ID	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
B9.2.2	2138	NA	NA	164	1	97	187	1	4	Baud Rate	BYTE	1	x0
B9.2.3	2187	NA	NA	NA	NA	NA	NA	NA	NA	IO Poll Type	BYTE	1	x0
B9.2.4	2212	NA	NA	NA	NA	NA	41	1	109	Dnet Comm Timeout	INTEGER	2	x0
B9.2.5	2519	NA	NA	NA	NA	NA	NA	NA	NA	Comm Card FB Fault Response	BYTE	1	x0
B11.1.1	910	710	2	162	1	199	187	1	10	Board Status	BYTE	1	x0
B11.1.2	1067	NA	NA	162	1	202	NA	NA	NA	Firmware Version	INTEGER	4	x0
B11.1.3	915	550	200	162	1	208	187	1	11	DI1, DI2, DI3	BYTE	1	x0
B11.1.4	914	761	2	162	1	207	187	1	12	DO1, DO2, DO3	BYTE	1	x0
B11.1.5	917	593	200	162	1	210	187	1	13	Thermistor Resistor	DOUBLE	4	x0
B11.1.6	913	753	200	162	1	206	187	1	14	Thermistor State	BYTE	1	x0
B11.2.1	244	461	200	162	1	203	187	1	15	DO1 Function	BYTE	1	x0
B11.2.2	245	461	201	162	1	204	187	1	16	DO2 Function	BYTE	1	x0
B11.2.3	246	461	202	162	1	205	187	1	17	DO3 Function	BYTE	1	x0
B11.2.4	916	343	200	162	1	209	187	1	18	Thermistor Config	BYTE	1	x0
B12.1.1	910	710	2	162	1	199	187	1	10	Board Status	BYTE	1	x0
B12.1.2	1067	NA	NA	162	1	202	NA	NA	NA	Firmware Version	INTEGER	4	x0
B12.1.3	920	560	200	162	1	229	187	1	20	AI1 Value	INTEGER	2	x1000
B12.1.4	923	570	200	162	1	232	187	1	21	AO1 Value	INTEGER	2	x1000
B12.1.5	925	570	201	162	1	234	187	1	22	AO2 Value	INTEGER	2	x1000
B12.2.1	919	NA	NA	162	1	228	187	1	23	AI1 Mode	BYTE	1	x0
B12.2.2	129	260	200	162	1	212	187	1	24	AI1 Signal Range	BYTE	1	x0
B12.2.3	130	264	200	162	1	213	187	1	25	AI1 Custom Min	INTEGER	2	x100
B12.2.4	131	265	200	162	1	214	187	1	26	AI1 Custom Max	INTEGER	2	x100
B12.2.5	128	266	200	162	1	227	187	1	27	AI1 Filter Time	INTEGER	2	x100
B12.2.6	132	267	200	162	1	211	187	1	28	AI1 Signal Invert	BOOLEAN	1	x0
B12.2.7	922	276	200	162	1	231	187	1	29	AO1 Mode	BYTE	1	x0
B12.2.8	275	460	200	162	1	215	187	1	30	AO1 Function	BYTE	1	x0
B12.2.9	276	279	200	162	1	216	187	1	31	AO1 Minimum	BYTE	1	x0
B12.2.10	277	277	200	162	1	217	187	1	32	AO1 Filter Time	INTEGER	2	x100
B12.2.11	278	274	200	162	1	218	187	1	33	AO1 Scale	INTEGER	2	x0
B12.2.12	279	278	200	162	1	219	187	1	34	AO1 Inversion	BOOLEAN	1	x0
B12.2.13	280	275	200	162	1	220	187	1	35	AO1 Offset	INTEGER	2	x100
B12.2.14	924	276	201	162	1	233	187	1	36	AO2 Mode	BYTE	1	x0
B12.2.15	281	460	201	162	1	221	187	1	37	AO2 Function	BYTE	1	x0
B12.2.16	282	279	201	162	1	222	187	1	38	AO2 Minimum	BYTE	1	x0
B12.2.17	283	277	201	162	1	223	187	1	39	AO2 Filter Time	INTEGER	2	x100
B12.2.18	284	274	201	162	1	224	187	1	40	AO2 Scale	INTEGER	2	x0
B12.2.19	285	278	201	162	1	225	187	1	41	AO2 Inversion	BOOLEAN	1	x0
B12.2.20	286	275	201	162	1	226	187	1	42	AO2 Offset	INTEGER	2	x100
B13.1.1	910	710	2	162	1	199	187	1	10	Board Status	BYTE	1	x0
B13.1.2	1067	NA	NA	162	1	202	NA	NA	NA	Firmware Version	INTEGER	4	x0
B13.1.3	926	762	2	162	1	238	187	1	44	RO1, RO2, RO3	BYTE	1	x0
B13.2.1	552	451	200	162	1	235	187	1	45	RO1 Function	BYTE	1	x0
B13.2.2	555	451	201	162	1	236	187	1	46	RO2 Function	BYTE	1	x0
B13.2.3	556	451	202	162	1	237	187	1	47	RO3 Function	BYTE	1	x0
B14.1.1	910	710	2	162	1	199	187	1	10	Board Status	BYTE	1	x0
B14.1.2	1067	NA	NA	162	1	202	NA	NA	NA	Firmware Version	INTEGER	4	x0
B14.1.3	931	757	2	162	1	243	187	1	49	PT100 State	INTEGER	6	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
B14.1.4	928	NA	NA	162	1	242	187	1	50	PT100 Values	INTEGER	6	x10
B14.2.1	927	342	200	162	1	239	187	1	51	PT100-3,2,1	BYTE	1	x0
B14.2.2	937	581	200	162	1	240	187	1	52	PT100 Warning Limit	INTEGER	2	x10
B14.2.3	938	582	200	162	1	241	187	1	53	PT100 Fault Limit	INTEGER	2	x10
B15.1.1	910	710	2	162	1	199	187	1	10	Board Status	BYTE	1	x0
B15.1.2	1067	NA	NA	162	1	202	NA	NA	NA	Firmware Version	INTEGER	4	x0
B15.1.3	934	760	4	162	1	244	187	1	55	AC1, AC2, AC3	BYTE	1	x0
B15.1.4	1697	760	8	162	1	245	187	1	56	AC4, AC5, AC6	BYTE	1	x0
B16.1.1.1	910	710	2	162	1	199	187	1	10	Board Status	BYTE	1	x0
B16.1.1.2	1067	NA	NA	162	1	202	NA	NA	NA	Firmware Version	INTEGER	4	x0
B16.1.1.3	2142	NA	NA	164	1	101	NA	NA	NA	Protocol Status	BYTE	1	x0
B16.1.1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Telegram Selection	INTEGER	2	x0
B16.1.1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Fault Counter PDP	INTEGER	2	x0
B16.1.1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	Fault Situations Max	INTEGER	4	x0
B16.1.1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Profil Number	INTEGER	2	x0
B16.1.1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Control Word	INTEGER	2	x0
B16.1.1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Status Word	INTEGER	2	x0
B16.1.2.1	2621	NA	NA	NA	NA	NA	NA	NA	NA	PDP-MaxBlockLength	BYTE	1	x0
B16.1.2.2	2622	NA	NA	NA	NA	NA	NA	NA	NA	PDP-NoOfMultiparameter	BYTE	1	x0
B16.1.2.3	2623	NA	NA	NA	NA	NA	NA	NA	NA	PDP-MaxLatency	BYTE	1	x0
B16.1.3.1	2624	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO Manufacturer	INTEGER	2	x0
B16.1.3.2	1451	NA	NA	1	1	3	150	1	4	PDP-DO Device Type			
B16.1.3.3	2625	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO FW-Interface	INTEGER	2	x0
B16.1.3.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO FW-Year	INTEGER	2	x0
B16.1.3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO FW-DayMonth	INTEGER	2	x0
B16.1.3.6	2628	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO NoOfDOs	INTEGER	2	x0
B16.1.3.7	2629	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO Subclass	BYTE	1	x0
B16.2.1	1250	3201	200	163	1	120	NA	NA	NA	Slave Address	BYTE	1	x0
B16.2.2	1251	3202	200	163	1	121	NA	NA	NA	Baud Rate	BYTE	1	x0
B16.2.3	1253	3200	200	163	1	123	NA	NA	NA	Operate Mode	BYTE	1	x0
B16.2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	Parameter Access	INTEGER	2	x0
B16.2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Process Data Access	INTEGER	2	x0
B16.2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	Fault Situation Counter	INTEGER	2	x0
B16.2.7	619	970	0	162	1	22	183	1	3	Parameter Sets	BYTE	1	x0
B17.1.1	910	710	2	162	1	199	187	1	10	Board Status	BYTE	1	x0
B17.1.2	1067	NA	NA	162	1	202	NA	NA	NA	Firmware Version	INTEGER	4	x0
B17.1.3	2143	NA	NA	164	1	102	NA	NA	NA	Protocol Status	BYTE	1	x0
B17.2.1	2144	NA	NA	164	1	103	NA	NA	NA	Node ID	BYTE	1	x0
B17.2.2	2145	NA	NA	164	1	104	NA	NA	NA	Baud Rate	BYTE	1	x0
B17.2.3	2146	NA	NA	164	1	105	NA	NA	NA	Operate Mode	BYTE	1	x0
B17.2.4	2520	NA	NA	NA	NA	NA	NA	NA	NA	Comm Card FB Fault Response	BYTE	1	x0
B18.1.1	910	710	2	162	1	199	187	1	10	Board Status	BYTE	1	x0
B18.1.2	1067	NA	NA	162	1	202	NA	NA	NA	Firmware Version	INTEGER	4	x0
B18.1.3	2147	NA	NA	164	1	106	187	1	69	Protocol Status	BYTE	1	x0
B18.2.1	2148	NA	NA	164	1	107	187	1	70	MAC ID	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS		EtherNet/IP			DeviceNet			Parameter Description	Data Type	Length (in Bytes)	Display Format
		PNU	PNU SubIndex	Class	Instance	Attribute	Class	Instance	Attribute				
B18.2.2	2149	NA	NA	164	1	108	187	1	71	Baud Rate	BYTE	1	x0
B18.2.3	2188	NA	NA	NA	NA	NA	NA	NA	NA	IO Poll Type	BYTE	1	x0
B18.2.4	2212	NA	NA	NA	NA	NA	41	1	109	Dnet Comm Timeout	INTEGER	2	x0
B18.2.5	2520	NA	NA	NA	NA	NA	NA	NA	NA	Comm Card FB Fault Response	BYTE	1	x0
B19.1.1.1	2609	NA	NA	NA	NA	NA	NA	NA	NA	Board Status	BYTE	1	x0
B19.1.1.2	2610	NA	NA	NA	NA	NA	NA	NA	NA	Firmware Version	INTEGER	4	x0
B19.1.1.3	2612	NA	NA	NA	NA	NA	NA	NA	NA	Protocol Status	BYTE	1	x0
B19.1.1.4	2613	NA	NA	NA	NA	NA	NA	NA	NA	Operation Mode	BYTE	1	x0
B19.1.1.5	2614	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Telegram Selection	INTEGER	2	x0
B19.1.1.6	2615	NA	NA	NA	NA	NA	NA	NA	NA	Fault Counter PDP	INTEGER	2	x0
B19.1.1.7	2616	NA	NA	NA	NA	NA	NA	NA	NA	Fault Situations Max	INTEGER	4	x0
B19.1.1.8	2618	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Profil Number	INTEGER	2	x0
B19.1.1.9	2619	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Control Word	INTEGER	2	x0
B19.1.1.10	2620	NA	NA	NA	NA	NA	NA	NA	NA	PDP-Status Word	INTEGER	2	x0
B19.1.2.1	2621	NA	NA	NA	NA	NA	NA	NA	NA	PDP-MaxBlockLength	BYTE	1	x0
B19.1.2.2	2622	NA	NA	NA	NA	NA	NA	NA	NA	PDP-NoOfMultiparameter			
B19.1.2.3	2623	NA	NA	NA	NA	NA	NA	NA	NA	PDP-MaxLatency	BYTE	1	x0
B19.1.3.1	2624	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO Manufacturer	BYTE	1	x0
B19.1.3.2	1451	NA	NA	1	1	3	150	1	4	PDP-DO Device Type	INTEGER	2	x0
B19.1.3.3	2625	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO FW-Interface	INTEGER	2	x0
B19.1.3.4	2626	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO FW-Year	INTEGER	2	x0
B19.1.3.5	2627	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO FW-DayMonth	INTEGER	2	x0
B19.1.3.6	2628	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO NoOfDOs	INTEGER	2	x0
B19.1.3.7	2629	NA	NA	NA	NA	NA	NA	NA	NA	PDP-DO Subclass	BYTE	1	x0
B19.2.1	2630	NA	NA	NA	NA	NA	NA	NA	NA	Parameter Access	INTEGER	2	x0
B19.2.2	2631	NA	NA	NA	NA	NA	NA	NA	NA	Process Data Access	INTEGER	2	x0
B19.2.3	2632	NA	NA	NA	NA	NA	NA	NA	NA	Fault Situation Counter	INTEGER	2	x0
B19.2.4	619	970	0	162	1	22	183	1	3	Parameter Sets	BYTE	1	x0
O1	1	502	0	160	1	1	160	1	1	Output Frequency	INTEGER	2	x100
O2	24	1	0	160	1	2	160	1	2	Freq Reference	INTEGER	2	x100
O3	2	503	0	4	70	3	4	70	3	Motor Speed	INTEGER	2	x0
O4	3	504	0	160	1	4	160	1	4	Motor Current	INTEGER	2	x10
O5	4	507	0	160	1	5	160	1	5	Motor Torque	INTEGER	2	x10
O6	5	513	1	160	1	6	160	1	6	Motor Power	INTEGER	2	x10
O7	6	501	0	160	1	7	160	1	7	Motor Voltage	INTEGER	2	x10
O8	7	501	1	160	1	8	160	1	8	DC-link Voltage	INTEGER	2	x0
O9	8	822	6	160	1	9	160	1	9	Unit Temperature	INTEGER	2	x10
O10	9	822	4	160	1	10	160	1	10	Motor Temperature	INTEGER	2	x10
R11	782	2	2	162	1	138	161	1	11	Keypad Torque Ref	INTEGER	2	x10
R12	141	1	8	160	1	155	161	1	12	Keypad Reference	INTEGER	2	x100
R13	1307	2170	0	160	1	226	170	1	11	PID1 Keypad Set Point 1	DOUBLE	4	x100
R14	1309	2179	0	160	1	227	170	1	12	PID1 Keypad Set Point 2	DOUBLE	4	x100
	142	256	0	160	1	46	183	1	2	Application	BYTE	1	x0

Table 205. DG1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	EtherNet/IP Class	EtherNet/IP Instance	EtherNet/IP Attribute	DeviceNet Class	DeviceNet Instance	DeviceNet Attribute	Parameter Description	Data Type	Length (in Bytes)	Display Format
	340	323	0	162	1	21	183	1	1	Language	BYTE	1	x0
	566	3000	0	160	1	21	185	1	1	Real Time Clock	BYTE	6	x0
	582	3001	0	162	1	12	185	1	2	Daylight Saving	BYTE	1	x0
	101	20	0	160	1	162	162	1	1	Min Frequency	INTEGER	2	x100
	102	20	1	160	1	163	162	1	2	Max Frequency	INTEGER	2	x100
	486	210	0	40	2	6	40	2	6	Motor Nom Current	INTEGER	2	x10
	107	281	0	42	1	10	42	1	10	Current Limit	INTEGER	2	x10
	489	217	0	40	2	15	40	2	15	Motor Nom Speed	INTEGER	2	x0
	490	215	0	161	1	116	162	1	7	Motor PF	INTEGER	2	x100
	487	211	0	40	2	7	40	2	7	Motor Nom Voltage	INTEGER	2	x0
	488	216	0	161	1	118	162	1	9	Motor Nom Frequency	INTEGER	2	x100
	103	130	0	160	1	164	162	1	3	Accel Time 1	INTEGER	2	x10
	104	134	0	160	1	165	162	1	4	Decel Time 1	INTEGER	2	x10
	1695	NA	NA	164	1	63	162	1	12	Local Control Place	BYTE	1	x0
	136	436	0	160	1	152	162	1	13	Local Reference	BYTE	1	x0
	135	408	0	160	1	150	162	1	11	Remote 1 Control Place	BYTE	1	x0
	137	437	0	160	1	153	162	1	14	Remote 1 Reference	BYTE	1	x0
	1297	2870	0	160	1	219	170	1	4	PID1 Process Unit	BYTE	1	x0
	1298	2871	0	160	1	221	170	1	5	PID1 Process Unit Min	DOUBLE	4	x100
	1300	2872	0	160	1	222	170	1	6	PID1 Process Unit Max	DOUBLE	4	x100
	1312	2110	0	160	1	229	170	1	14	PID1 Set Point 1 Source	BYTE	1	x0
	1307	2170	0	160	1	226	170	1	11	PID1 Keypad Set Point 1	DOUBLE	4	x100
	1332	2112	0	160	1	247	170	1	32	PID1 Feedback 1 Source	BYTE	1	x0
	1333	2172	0	160	1	248	170	1	33	PID1 Feedback 1 Min	INTEGER	2	x100
	1334	2173	0	160	1	249	170	1	34	PID1 Feedback 1 Max	INTEGER	2	x100
	1297	2870	0	160	1	219	170	1	4	PID1 Process Unit	BYTE	1	x0
	1298	2871	0	160	1	221	170	1	5	PID1 Process Unit Min	DOUBLE	4	x100
	1300	2872	0	160	1	222	170	1	6	PID1 Process Unit Max	DOUBLE	4	x100
	1312	2110	0	160	1	229	170	1	14	PID1 Set Point 1 Source	BYTE	1	x0
	1307	2170	0	160	1	226	170	1	11	PID1 Keypad Set Point 1	DOUBLE	4	x100
	1332	2112	0	160	1	247	170	1	32	PID1 Feedback 1 Source	BYTE	1	x0
	1333	2172	0	160	1	248	170	1	33	PID1 Feedback 1 Min	INTEGER	2	x100
	1334	2173	0	160	1	249	170	1	34	PID1 Feedback 1 Max	INTEGER	2	x100
	342	1906	0	161	1	137	178	1	1	Number of Pumps	BYTE	1	x0
	2458	NA	NA	NA	NA	NA	NA	NA	NA	PID Bandwidth	DOUBLE	4	x100
	344	1923	0	161	1	139	178	1	3	Add/Remove Delay	INTEGER	2	x0
	350	1909	0	161	1	140	178	1	4	Interlock Enable	BYTE	1	x0

Table 206. DH1 Parameter ID list

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
M1.1	1	502	0	Output Frequency	INTEGER	2	x100
M1.2	24	1	0	Freq Reference	INTEGER	2	x100
M1.3	2	503	0	Motor Speed	INTEGER	2	x0
M1.4	3	504	0	Motor Current	INTEGER	2	x10
M1.5	4	507	0	Motor Torque	INTEGER	2	x10
M1.6	5	513	1	Motor Power	INTEGER	2	x10
M1.7	6	501	0	Motor Voltage	INTEGER	2	x10
M1.8	7	501	1	DC-link Voltage	INTEGER	2	x0
M1.9	8	822	6	Unit Temperature	INTEGER	2	x10
M1.10	9	822	4	Motor Temperature	INTEGER	2	x10
M1.11	28	NA	NA	Latest Fault Code	BYTE	1	x0
M1.12	1686	NA	NA	Instant Motor Power	DOUBLE	4	x1000
M1.13	583	790	0	RTC Battery Status	BYTE	1	x0
M2.1	10	560	0	Analog Input 1	INTEGER	2	x100
M2.2	11	560	1	Analog Input 2	INTEGER	2	x100
M2.3	25	570	0	Analog Output 1	INTEGER	2	x100
M2.4	575	570	1	Analog Output 2	INTEGER	2	x100
M2.5	12	760	0	DI1, DI2, DI3	BYTE	1	x0
M2.6	13	760	1	DI4, DI5, DI6	BYTE	1	x0
M2.7	576	760	2	DI7, DI8	BYTE	1	x0
M2.8	14	754	0	DO1,Virtual RO1,Virtual RO2	BYTE	1	x0
M2.9	557	762	0	RO1, RO2, RO3	BYTE	1	x0
M3.1	27	580	0	PT100 Temperture	INTEGER	2	x10
M4.1	2120	NA	NA	Energy Savings	DOUBLE	4	x1000
M5.1	2209	NA	NA	Control Board DIDO Status	INTEGER	2	x0
M5.2	2210	NA	NA	SlotA DIDO Status	INTEGER	2	x0
M5.3	2211	NA	NA	SlotB DIDO Status	INTEGER	2	x0
M5.4	29	NA	NA	Application Status Word	INTEGER	2	x0
M5.5	2414	NA	NA	Standard Status Word	INTEGER	2	x0
M6.1	16	2150	0	PID1 Set Point	DOUBLE	4	x100
M6.2	18	2864	0	PID1 Feedback	DOUBLE	4	x100
M6.3	20	2167	0	PID1 Error Value	DOUBLE	4	x100
M6.4	22	2124	0	PID1 Output	INTEGER	2	x100
M6.5	23	2133	0	PID1 Status	BYTE	1	x0
M6.6	32	2150	1	PID2 Set Point	DOUBLE	4	x100
M6.7	34	2864	1	PID2 Feedback	DOUBLE	4	x100
M6.8	36	2167	1	PID2 Error Value	DOUBLE	4	x100
M6.9	38	2124	1	PID2 Output	INTEGER	2	x100
M6.10	39	2133	1	PID2 Status	BYTE	1	x0
M7.1	558	763	0	TC1, TC2, TC3	BYTE	1	x0
M7.2	559	3125	0	Interval 1	BOOLEAN	1	x0
M7.3	560	3125	1	Interval 2	BOOLEAN	1	x0
M7.4	561	3125	2	Interval 3	BOOLEAN	1	x0
M7.5	562	3125	3	Interval 4	BOOLEAN	1	x0
M7.6	563	3125	4	Interval 5	BOOLEAN	1	x0
M7.7	569	3101	0	Timer 1	DOUBLE	4	x0
M7.8	571	3101	1	Timer 2	DOUBLE	4	x0
M7.9	573	3101	2	Timer 3	DOUBLE	4	x0
M8.1	2445	NA	NA	Output	DOUBLE	4	x100
M8.2	2447	NA	NA	Reference	DOUBLE	4	x100
M9.1	601	520	2	Total MWh Count	DOUBLE	4	x10000

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
M9.2	603	522	0	Total Power Day Count	INTEGER	2	x0
M9.3	606	821	1	Total Power Hr Count	DOUBLE	4	x0
M9.4	604	806	0	Trip MWh Count	DOUBLE	4	x10000
M9.5	636	870	0	Trip Power Day Count	INTEGER	2	x0
M9.6	637	871	0	Trip Power Hr Count	DOUBLE	4	x0
M10.1	30	329	0	Multi-Monitoring	BYTE	3	x0
P1.1	101	20	0	Min Frequency	INTEGER	2	x100
P1.2	102	20	1	Max Frequency	INTEGER	2	x100
P1.3	103	130	0	Accel Time 1	INTEGER	2	x10
P1.4	104	134	0	Decel Time 1	INTEGER	2	x10
P1.5	486	210	0	Motor Nom Current	INTEGER	2	x10
P1.6	489	217	0	Motor Nom Speed	INTEGER	2	x0
P1.7	490	215	0	Motor PF	INTEGER	2	x100
P1.8	487	211	0	Motor Nom Voltage	INTEGER	2	x0
P1.9	488	216	0	Motor Nom Frequency	INTEGER	2	x100
P1.10	2465	NA	NA	HOA Source	BYTE	1	x0
P1.11	1695	NA	NA	Hand Control Place	BYTE	1	x0
P1.12	136	436	0	Hand Reference	BYTE	1	x0
P1.13	135	408	0	Auto 1 Control Place	BYTE	1	x0
P1.14	137	437	0	Auto 1 Reference	BYTE	1	x0
P1.15	138	408	1	Auto 2 Control Place	BYTE	1	x0
P1.16	139	437	1	Auto 2 Reference	BYTE	1	x0
P2.1.1	483	636	0	Damper Start	BYTE	1	x0
P2.1.2	484	118	0	Damper Time Out	INTEGER	2	x0
P2.1.3	485	118	1	Damper Delay	INTEGER	2	x0
P2.1.4	144	35	1	AI Ref Scale Min Value	INTEGER	2	x100
P2.1.5	145	34	1	AI Ref Scale Max Value	INTEGER	2	x100
P2.2.1	143	425	0	IO Terminal 1 Start Stop Logic	BYTE	1	x0
P2.2.2	190	414	0	IO Terminal 1 Start Signal 1	BYTE	1	x0
P2.2.3	191	414	1	IO Terminal 1 Start Signal 2	BYTE	1	x0
P2.2.4	2206	NA	NA	IO Terminal 2 Start Stop Logic	BYTE	1	x0
P2.2.5	2207	NA	NA	IO Terminal 2 Start Signal 1	BYTE	1	x0
P2.2.6	2208	NA	NA	IO Terminal 2 Start Signal 2	BYTE	1	x0
P2.2.7	881	409	0	Thermistor Input Select	BYTE	1	x0
P2.2.8	198	421	2	Reverse	BYTE	1	x0
P2.2.9	192	446	0	Ext. Fault 1 NO	BYTE	1	x0
P2.2.10	193	447	0	Ext. Fault 1 NC	BYTE	1	x0
P2.2.11	2297	NA	NA	Ext. Fault 1 Text	BYTE	1	x0
P2.2.12	2293	NA	NA	Ext. Fault 2 NO	BYTE	1	x0
P2.2.13	2294	NA	NA	Ext. Fault 2 NC	BYTE	1	x0
P2.2.14	2298	NA	NA	Ext. Fault 2 Text	BYTE	1	x0
P2.2.15	2295	NA	NA	Ext. Fault 3 NO	BYTE	1	x0
P2.2.16	2296	NA	NA	Ext. Fault 3 NC	BYTE	1	x0
P2.2.17	2299	NA	NA	Ext. Fault 3 Text	BYTE	1	x0
P2.2.18	200	400	7	Fault Reset	BYTE	1	x0
P2.2.19	194	400	16	Run Enable	BYTE	1	x0
P2.2.20	205	432	0	Preset Speed B0	BYTE	1	x0
P2.2.21	206	432	1	Preset Speed B1	BYTE	1	x0
P2.2.22	207	432	2	Preset Speed B2	BYTE	1	x0
P2.2.23	199	400	8	Jog Enable	BYTE	1	x0
P2.2.24	195	435	0	Accel/Decel Time Set	BYTE	1	x0

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P2.2.25	201	400	5	Accel/Decel Prohibit	BYTE	1	x0
P2.2.26	215	402	5	No Access To Param	BYTE	1	x0
P2.2.27	196	406	0	Auto Control	BYTE	1	x0
P2.2.28	197	406	1	Hand Control	BYTE	1	x0
P2.2.29	209	407	0	Auto 1/2 Select	BYTE	1	x0
P2.2.30	2395	NA	NA	HOA On/Off	BYTE	1	x0
P2.2.31	217	417	0	Second Motor Para Select	BYTE	1	x0
P2.2.32	2312	NA	NA	Parameter Set1/2 Sel	BYTE	1	x0
P2.2.33	208	415	0	AI Ref Source Select	BYTE	1	x0
P2.2.34	218	NA	NA	Bypass Start	BYTE	1	x0
P2.2.35	1246	1804	0	Bypass Overload	BYTE	1	x0
P2.2.36	550	2134	0	PID1 Control Enable	BYTE	1	x0
P2.2.37	553	2134	1	PID2 Control Enable	BYTE	1	x0
P2.2.38	351	410	0	PID1 Set Point Select	BYTE	1	x0
P2.2.39	352	410	1	PID2 Set Point Select	BYTE	1	x0
P2.2.40	202	402	4	DC Brake Active	BYTE	1	x0
P2.2.41	219	402	2	Smoke Mode	BYTE	1	x0
P2.2.42	220	402	3	Fire Mode	BYTE	1	x0
P2.2.43	221	439	0	Fire Mode Ref 1/2 Select	BYTE	1	x0
P2.2.44	2119	NA	NA	Fire Mode Reverse	BYTE	1	x0
P2.2.45	224	3104	0	Start Timer 1	BYTE	1	x0
P2.2.46	225	3104	1	Start Timer 2	BYTE	1	x0
P2.2.47	226	3104	2	Start Timer 3	BYTE	1	x0
P2.3.1	105	5	1	Preset Speed 1	INTEGER	2	x100
P2.3.2	106	5	2	Preset Speed 2	INTEGER	2	x100
P2.3.3	118	5	3	Preset Speed 3	INTEGER	2	x100
P2.3.4	119	5	4	Preset Speed 4	INTEGER	2	x100
P2.3.5	120	5	5	Preset Speed 5	INTEGER	2	x100
P2.3.6	121	5	6	Preset Speed 6	INTEGER	2	x100
P2.3.7	122	5	7	Preset Speed 7	INTEGER	2	x100
P2.3.8	117	1	9	Jog Reference	INTEGER	2	x100
P2.4.1	222	263	0	AI1 Mode	BYTE	1	x0
P2.4.2	175	260	0	AI1 Signal Range	BYTE	1	x0
P2.4.3	176	264	0	AI1 Custom Min	INTEGER	2	x100
P2.4.4	177	265	0	AI1 Custom Max	INTEGER	2	x100
P2.4.5	174	266	0	AI1 Filter Time	INTEGER	2	x100
P2.4.6	181	267	0	AI1 Signal Invert	BOOLEAN	1	x0
P2.4.7	178	1711	0	AI1 Joystick Hyst	INTEGER	2	x100
P2.4.8	179	1720	0	AI1 Sleep Limit	INTEGER	2	x100
P2.4.9	180	1721	0	AI1 Sleep Delay	INTEGER	2	x100
P2.4.10	133	1712	0	AI1 Joystick Offset	INTEGER	2	x100
P2.5.1	223	263	1	AI2 Mode	BYTE	1	x0
P2.5.2	183	260	1	AI2 Signal Range	BYTE	1	x0
P2.5.3	184	264	1	AI2 Custom Min	INTEGER	2	x100
P2.5.4	185	265	1	AI2 Custom Max	INTEGER	2	x100
P2.5.5	182	266	1	AI2 Filter Time	INTEGER	2	x100
P2.5.6	189	267	1	AI2 Signal Invert	BOOLEAN	1	x0
P2.5.7	186	1711	1	AI2 Joystick Hyst	INTEGER	2	x100
P2.5.8	187	1720	1	AI2 Sleep Limit	INTEGER	2	x100
P2.5.9	188	1721	1	AI2 Sleep Delay	INTEGER	2	x100
P2.5.10	134	1712	1	AI2 Joystick Offset	INTEGER	2	x100

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P3.1.1	151	461	0	DO1 Function	BYTE	1	x0
P3.1.2	152	451	0	RO1 Function	BYTE	1	x0
P3.1.3	2112	NA	NA	RO1 On Delay	INTEGER	2	x10
P3.1.4	2113	NA	NA	RO1 Off Delay	INTEGER	2	x10
P3.1.5	153	451	1	RO2 Function	BYTE	1	x0
P3.1.6	2114	NA	NA	RO2 On Delay	INTEGER	2	x10
P3.1.7	2115	NA	NA	RO2 Off Delay	INTEGER	2	x10
P3.1.8	538	451	2	RO3 Function	BYTE	1	x0
P3.1.9	2116	NA	NA	RO3 On Delay	INTEGER	2	x10
P3.1.10	2117	NA	NA	RO3 Off Delay	INTEGER	2	x10
P3.1.11	2118	NA	NA	RO3 Reverse	BYTE	1	x0
P3.1.12	2463	NA	NA	Virtual RO1 Function	BYTE	1	x0
P3.1.13	2464	NA	NA	Virtual RO2 Function	BYTE	1	x0
P3.2.1	154	1201	0	Freq Limit 1 Supv	BYTE	1	x0
P3.2.2	155	1101	0	Freq Limit 1 Supv Val	INTEGER	2	x100
P3.2.3	2200	NA	NA	Freq Limit 1 Supv Hyst	INTEGER	2	x100
P3.2.4	157	1201	1	Freq Limit 2 Supv	BYTE	1	x0
P3.2.5	158	1101	1	Freq Limit 2 Supv Val	INTEGER	2	x100
P3.2.6	2201	NA	NA	Freq Limit 2 Supv Hyst	INTEGER	2	x100
P3.2.7	159	1202	0	Torque Limit Supv	BYTE	1	x0
P3.2.8	160	1102	0	Torque Limit Supv Val	INTEGER	2	x10
P3.2.9	2202	NA	NA	Torque Limit Supv Hyst	INTEGER	2	x10
P3.2.10	161	1200	0	Ref Limit Supv	BYTE	1	x0
P3.2.11	162	1100	0	Ref Limit Supv Val	INTEGER	2	x100
P3.2.12	2203	NA	NA	Ref Limit Supv Hyst	INTEGER	2	x100
P3.2.13	165	1222	1	Temp Limit Supv	BYTE	1	x0
P3.2.14	166	822	0	Temp Limit Supv Val	INTEGER	2	x10
P3.2.15	2204	NA	NA	Temp Limit Supv Hyst	INTEGER	2	x10
P3.2.16	167	1203	0	Power Limit Supv	BYTE	1	x0
P3.2.17	168	1103	0	Power Limit Supv Val	INTEGER	2	x10
P3.2.18	2205	NA	NA	Power Limit Supv Hyst	INTEGER	2	x10
P3.2.19	170	1504	0	AI Supv Select	BYTE	1	x0
P3.2.20	171	1204	0	AI Limit Supv	BYTE	1	x0
P3.2.21	172	1404	0	AI Limit Supv Val	INTEGER	2	x100
P3.2.22	2198	NA	NA	AI Supv Hyst	INTEGER	2	x100
P3.2.23	2189	NA	NA	Motor Current 1 Supv	BYTE	1	x0
P3.2.24	2190	NA	NA	Motor Current 1 Supv Value	INTEGER	2	x10
P3.2.25	2196	NA	NA	Motor Current 1 Supv Hyst	BYTE	1	x10
P3.2.26	2191	NA	NA	Motor Current 2 Supv	BYTE	1	x0
P3.2.27	2192	NA	NA	Motor Current 2 Supv Value	INTEGER	2	x10
P3.2.28	2197	NA	NA	Motor Current 2 Supv Hyst	BYTE	1	x10
P3.2.29	2193	NA	NA	Second AI Supv Select	BYTE	1	x0
P3.2.30	2194	NA	NA	Second AI Limit Supv	BYTE	1	x0
P3.2.31	2195	NA	NA	Second AI Limit Supv Val	INTEGER	2	x100
P3.2.32	2199	NA	NA	Second AI Supv Hyst	INTEGER	2	x100
P3.2.33	1346	2860	0	PID1 Superv Enable	BOOLEAN	1	x0
P3.2.34	1347	2861	0	PID1 Superv Upper Limit	DOUBLE	4	x100
P3.2.35	1349	2862	0	PID1 Superv Lower Limit	DOUBLE	4	x100
P3.2.36	1351	2863	0	PID1 Superv Delay	INTEGER	2	x0
P3.2.37	1408	2860	1	PID2 Superv Enable	BOOLEAN	1	x0
P3.2.38	1409	2861	1	PID2 Superv Upper Limit	DOUBLE	4	x100

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P3.2.39	1411	2862	1	PID2 Superv Lower Limit	DOUBLE	4	x100
P3.2.40	1413	2863	1	PID2 Superv Delay	INTEGER	2	x0
P3.3.1	227	276	0	AO1 Mode	BYTE	1	x0
P3.3.2	146	460	0	AO1 Function	BYTE	1	x0
P3.3.3	149	279	0	AO1 Minimum	BYTE	1	x0
P3.3.4	147	277	0	AO1 Filter Time	INTEGER	2	x100
P3.3.5	150	274	0	AO1 Scale	INTEGER	2	x0
P3.3.6	148	278	0	AO1 Inversion	BOOLEAN	1	x0
P3.3.7	173	275	0	AO1 Offset	INTEGER	2	x100
P3.4.1	228	276	1	AO2 Mode	BYTE	1	x0
P3.4.2	229	460	1	AO2 Function	BYTE	1	x0
P3.4.3	232	279	1	AO2 Minimum	BYTE	1	x0
P3.4.4	230	277	1	AO2 Filter Time	INTEGER	2	x100
P3.4.5	233	274	1	AO2 Scale	INTEGER	2	x0
P3.4.6	231	278	1	AO2 Inversion	BOOLEAN	1	x0
P3.4.7	234	275	1	AO2 Offset	INTEGER	2	x100
P3.5.1	751	2002	0	Logic Function Select	BYTE	1	x0
P3.5.2	752	2000	0	Logic Operation Input A	BYTE	1	x0
P3.5.3	753	2001	0	Logic Operation Input B	BYTE	1	x0
P4.1.1	141	1	8	Keypad Reference	INTEGER	2	x100
P4.1.2	116	621	1	Keypad Direction	BOOLEAN	1	x0
P4.1.3	114	622	1	Keypad Stop	BOOLEAN	1	x0
P4.1.4	1724	NA	NA	Hand Key Enable	BYTE	1	x0
P4.1.5	1679	622	3	Reverse Enable	BYTE	1	x0
P4.1.6	2515	NA	NA	Change Phase Sequence Motor	BYTE	1	x0
P4.1.7	1685	NA	NA	Power Up HOA Select	BYTE	1	x0
P4.1.8	2462	NA	NA	Bumpless Enable	BYTE	1	x0
P4.1.9	2423	NA	NA	Run Delay Time	INTEGER	2	x0
P4.1.10	252	620	0	Start Mode	BYTE	1	x0
P4.1.11	253	620	1	Stop Mode	BYTE	1	x0
P4.1.12	247	117	0	Ramp 1 Shape	INTEGER	2	x10
P4.1.13	248	117	1	Ramp 2 Shape	INTEGER	2	x10
P4.1.14	249	130	1	Accel Time 2	INTEGER	2	x10
P4.1.15	250	134	1	Decel Time 2	INTEGER	2	x10
P4.1.16	267	639	0	Power Loss Function	BYTE	1	x0
P4.1.17	268	151	0	Power Loss Time	INTEGER	2	x10
P4.1.18	2444	NA	NA	2nd Stage Ramp Frequency	INTEGER	2	x100
P4.2.1	254	2227	0	DC-Brake Current	INTEGER	2	x10
P4.2.2	263	2222	0	Start DC-Brake Time	INTEGER	2	x100
P4.2.3	262	2223	0	Stop DC-Brake Frequency	INTEGER	2	x100
P4.2.4	255	2222	1	Stop DC-Brake Time	INTEGER	2	x100
P4.2.5	251	2204	0	Brake Chopper Define	BYTE	1	x0
P4.2.6	266	2214	0	Flux Brake	BOOLEAN	1	x0
P4.2.7	265	2217	0	Flux Brake Current	INTEGER	2	x10
P4.3.1	264	43	0	Skip Range Ramp Factor	INTEGER	2	x10
P4.3.2	256	41	0	Skip F1 Low Limit	INTEGER	2	x100
P4.3.3	257	42	0	Skip F1 High Limit	INTEGER	2	x100
P4.3.4	258	41	1	Skip F2 Low Limit	INTEGER	2	x100
P4.3.5	259	42	1	Skip F2 High Limit	INTEGER	2	x100
P4.3.6	260	41	2	Skip F3 Low Limit	INTEGER	2	x100
P4.3.7	261	42	2	Skip F3 High Limit	INTEGER	2	x100

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P4.4.1	2122	NA	NA	Currency	BYTE	1	x0
P4.4.2	2123	NA	NA	Energy Cost	INTEGER	2	x100
P4.4.3	2124	NA	NA	Data Type	BYTE	1	x0
P4.4.4	2125	NA	NA	Energy Savings Reset	BYTE	1	x0
P5.1.1	287	255	0	Motor Control Mode	BYTE	1	x0
P5.1.2	107	281	0	Current Limit	INTEGER	2	x10
P5.1.3	109	60	0	V/Hz Optimization	BOOLEAN	1	x0
P5.1.4	108	61	0	V/Hz Ratio	BYTE	1	x0
P5.1.5	289	23	0	Field Weakening Point	INTEGER	2	x100
P5.1.6	290	24	0	Voltage at FWP	INTEGER	2	x100
P5.1.7	291	23	1	V/Hz Mid Frequency	INTEGER	2	x100
P5.1.8	292	24	1	V/Hz Mid Voltage	INTEGER	2	x100
P5.1.9	293	27	0	Zero Frequency Voltage	INTEGER	2	x100
P5.1.10	2522	NA	NA	Switching Frequency	INTEGER	2	x10
P5.1.11	1665	341	0	Sine Filter Enable	BYTE	1	x0
P5.1.12	294	626	3	OverVoltage Control	BYTE	1	x0
P5.1.13	298	2901	0	Load Drooping	INTEGER	2	x100
P5.1.14	1630	2902	0	Droop Control Filter Time Constant	INTEGER	2	x0
P5.2.1	577	210	1	Motor Nom Current 2	INTEGER	2	x10
P5.2.2	578	217	1	Motor Nom Speed 2	INTEGER	2	x0
P5.2.3	579	215	1	Motor PF 2	INTEGER	2	x100
P5.2.4	580	211	1	Motor Nom Volt 2	INTEGER	2	x0
P5.2.5	581	216	1	Motor Nom Freq 2	INTEGER	2	x100
P6.1.1	308	840	9040	Output Phase Fault	BYTE	1	x0
P6.1.2	309	840	9008	Ground Fault	BYTE	1	x0
P6.1.3	2158	NA	NA	Ground Fault Limit	BYTE	1	x0
P6.1.4	310	840	17168	Motor Thermal Protection	BYTE	1	x0
P6.1.5	311	1012	0	Motor Thermal F0 Current	INTEGER	2	x10
P6.1.6	312	1011	0	Motor Thermal Time	BYTE	1	x0
P6.1.7	313	840	28963	Stall Protection	BYTE	1	x0
P6.1.8	314	1010	0	Stall Current Limit	INTEGER	2	x10
P6.1.9	315	1010	1	Stall Time Limit	INTEGER	2	x10
P6.1.10	316	1010	2	Stall Frequency Limit	INTEGER	2	x100
P6.1.11	317	840	28979	Underload Protection	BYTE	1	x0
P6.1.12	318	1013	0	Underload Fnom Torque	INTEGER	2	x10
P6.1.13	319	1013	1	Underload F0 Torque	INTEGER	2	x10
P6.1.14	320	1011	1	Underload Time Limit	INTEGER	2	x100
P6.1.15	333	840	28978	Thermistor Fault Response	BYTE	1	x0
P6.1.16	337	840	29536	PT100 Fault Response	BYTE	1	x0
P6.1.17	2159	NA	NA	Preheat Mode	BYTE	1	x0
P6.1.18	2160	NA	NA	Preheat Control Source	BYTE	1	x0
P6.1.19	2161	NA	NA	Preheat Enter Temp	INTEGER	2	x10
P6.1.20	2162	NA	NA	Preheat Quit Temp	INTEGER	2	x10
P6.1.21	2163	NA	NA	Preheat Output Volt	BYTE	1	x0
P6.2.1	750	861	0	Line Start Lockout	BYTE	1	x0
P6.2.2	2483	NA	NA	Fault Reset Start	BYTE	1	x0
P6.2.3	306	840	29520	4mA Input Fault	BYTE	1	x0
P6.2.4	331	1	7	4mA Fault Frequency	INTEGER	2	x100
P6.2.5	307	840	36864	External Fault	BYTE	1	x0
P6.2.6	332	840	12592	Input Phase Fault	BYTE	1	x0
P6.2.7	330	840	12576	Uvolt Fault Response	BYTE	1	x0

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P6.2.8	1564	840	16912	Unit Under Temp Prot	BYTE	1	x0
P6.2.9	955	840	35344	RTC Fault	BYTE	1	x0
P6.2.10	1256	840	35345	Replace Battery Fault Response	BYTE	1	x0
P6.2.11	1257	840	28688	Replace Fan Fault Response	BYTE	1	x0
P6.2.12	2126	NA	NA	Cold Weather Mode	BYTE	1	x0
P6.2.13	2127	NA	NA	Cold Weather Volt. Level	BYTE	1	x10
P6.2.14	2128	NA	NA	Cold Weather Time Out	BYTE	1	x0
P6.2.15	2129	NA	NA	Cold Weather Password	INTEGER	2	x0
P6.2.16	2130	NA	NA	Under Temp Fault Override	BYTE	1	x0
P6.2.17	2427	NA	NA	STO Fault Response	BYTE	1	x0
P6.3.1	334	840	29953	Fieldbus Fault Response	BYTE	1	x0
P6.3.2	335	840	35088	OPTCard Fault Response	BYTE	1	x0
P6.3.3	1678	840	30070	IP Address Confliction Resp	BYTE	1	x0
P6.3.4	2157	NA	NA	Keypad Comm Fault Response	BYTE	1	x0
P6.4.1	321	846	0	AR Wait Time	INTEGER	2	x100
P6.4.2	322	846	1	AR Trail Time	INTEGER	2	x100
P6.4.3	323	847	0	AR Start Function	BYTE	1	x0
P6.4.4	324	845	12832	Undervoltage Attempts	BYTE	1	x0
P6.4.5	325	845	12816	OverVoltage Attempts	BYTE	1	x0
P6.4.6	326	845	8736	OverCurrent Attempts	BYTE	1	x0
P6.4.7	327	845	29520	4mA Fault Attempts	BYTE	1	x0
P6.4.8	329	845	28978	Motor Temp Fault Attempts	BYTE	1	x0
P6.4.9	328	845	36864	External Fault Attempts	BYTE	1	x0
P6.4.10	336	845	28979	Underload Attempts	BYTE	1	x0
P7.1.1	1294	2100	0	PID1 Control Gain	INTEGER	2	x100
P7.1.2	1295	2101	0	PID1 Control ITime	INTEGER	2	x100
P7.1.3	1296	2102	0	PID1 Control DTime	INTEGER	2	x100
P7.1.4	1297	2870	0	PID1 Process Unit	BYTE	1	x0
P7.1.5	1298	2871	0	PID1 Process Unit Min	DOUBLE	4	x100
P7.1.6	1300	2872	0	PID1 Process Unit Max	DOUBLE	4	x100
P7.1.7	1302	2873	0	PID1 Process Unit Decimal	BYTE	1	x0
P7.1.8	1303	2850	0	PID1 Error Inversion	BOOLEAN	1	x0
P7.1.9	1304	2851	0	PID1 Dead Band	DOUBLE	4	x100
P7.1.10	1306	2852	0	PID1 Dead Band Delay	INTEGER	2	x100
P7.1.11	1311	2151	0	PID1 Ramp Time	INTEGER	2	x100
P7.2.1	2542	NA	NA	FB PID1 Set Point 1	DOUBLE	4	x100
P7.2.2	2544	NA	NA	FB PID1 Set Point 2	DOUBLE	4	x100
P7.2.3	2550	NA	NA	FB PID1 Feedback 1	INTEGER	2	x100
P7.2.4	2551	NA	NA	FB PID1 Feedback 2	INTEGER	2	x100
P7.2.5	2554	NA	NA	FB PID1 Feedforward 1	INTEGER	2	x100
P7.2.6	2555	NA	NA	FB PID1 Feedforward 2	INTEGER	2	x100
P7.3.1.1	1307	2170	0	PID1 Keypad Set Point 1	DOUBLE	4	x100
P7.3.1.2	1309	2179	0	PID1 Keypad Set Point 2	DOUBLE	4	x100
P7.3.1.3	2466	NA	NA	PID1 Wake Up Action	BYTE	1	x0
P7.3.2.1	1312	2110	0	PID1 Set Point 1 Source	BYTE	1	x0
P7.3.2.2	1313	2168	0	PID1 Set Point 1 Min	INTEGER	2	x100
P7.3.2.3	1314	2169	0	PID1 Set Point 1 Max	INTEGER	2	x100
P7.3.2.4	1315	2136	0	PID1 Set Point 1 Sleep Enable	BOOLEAN	1	x0
P7.3.2.5	2396	NA	NA	PID1 Set Point 1 Sleep Unit Sel	BYTE	1	x0
P7.3.2.6	2450	2137	0	PID1 Set Point 1 Sleep Level	DOUBLE	4	x100
P7.3.2.7	1317	2138	0	PID1 Set Point 1 Sleep Delay	INTEGER	2	x0

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P7.3.2.8	1318	2139	0	PID1 Set Point 1 Wake Up Level	DOUBLE	4	x100
P7.3.2.9	1320	2154	0	PID1 Set Point 1 Boost	BYTE	1	x10
P7.3.2.10	1352	2830	0	PID1 Set Point 1 Comp Enable	BOOLEAN	1	x0
P7.3.2.11	1353	2831	0	PID1 Set Point 1 Comp Max	INTEGER	2	x100
P7.3.3.1	1321	2116	0	PID1 Set Point 2 Source	BYTE	1	x0
P7.3.3.2	1322	2177	0	PID1 Set Point 2 Min	INTEGER	2	x100
P7.3.3.3	1323	2178	0	PID1 Set Point 2 Max	INTEGER	2	x100
P7.3.3.4	1324	2140	0	PID1 Set Point 2 Sleep Enable	BOOLEAN	1	x0
P7.3.3.5	2397	NA	NA	PID1 Set Point 2 Sleep Unit Sel	BYTE	1	x0
P7.3.3.6	2452	2141	0	PID1 Set Point 2 Sleep Level	DOUBLE	4	x100
P7.3.3.7	1326	2142	0	PID1 Set Point 2 Sleep Delay	INTEGER	2	x0
P7.3.3.8	1327	2143	0	PID1 Set Point 2 Wake Up Level	DOUBLE	4	x100
P7.3.3.9	1329	2157	0	PID1 Set Point 2 Boost	BYTE	1	x10
P7.3.3.10	1354	2835	0	PID1 Set Point 2 Comp Enable	BOOLEAN	1	x0
P7.3.3.11	1355	2836	0	PID1 Set Point 2 Comp Max	INTEGER	2	x100
P7.4.1.1	1330	2171	0	PID1 Feedback Function	BYTE	1	x0
P7.4.1.2	1331	2153	0	PID1 Feedback Gain	INTEGER	2	x10
P7.4.2.1	1332	2112	0	PID1 Feedback 1 Source	BYTE	1	x0
P7.4.2.2	1333	2172	0	PID1 Feedback 1 Min	INTEGER	2	x100
P7.4.2.3	1334	2173	0	PID1 Feedback 1 Max	INTEGER	2	x100
P7.4.3.1	1335	2117	0	PID1 Feedback 2 Source	BYTE	1	x0
P7.4.3.2	1336	2181	0	PID1 Feedback 2 Min	INTEGER	2	x100
P7.4.3.3	1337	2182	0	PID1 Feedback 2 Max	INTEGER	2	x100
P7.5.1.1	1338	2800	0	PID1 Feedforward Func	BYTE	1	x0
P7.5.1.2	1339	2801	0	PID1 Feedforward Gain	INTEGER	2	x10
P7.5.2.1	1340	2810	0	PID1 Feedforward 1 Source	BYTE	1	x0
P7.5.2.2	1341	2811	0	PID1 Feedforward 1 Min	INTEGER	2	x100
P7.5.2.3	1342	2812	0	PID1 Feedforward 1 Max	INTEGER	2	x100
P7.5.3.1	1343	2815	0	PID1 Feedforward 2 Source	BYTE	1	x0
P7.5.3.2	1344	2816	0	PID1 Feedforward 2 Min	INTEGER	2	x100
P7.5.3.3	1345	2817	0	PID1 Feedforward 2 Max	INTEGER	2	x100
P8.1.1	1356	2100	1	PID2 Control Gain	INTEGER	2	x100
P8.1.2	1357	2101	1	PID2 Control I Time	INTEGER	2	x100
P8.1.3	1358	2102	1	PID2 Control D Time	INTEGER	2	x100
P8.1.4	1359	2870	1	PID2 Process Unit	BYTE	1	x0
P8.1.5	1360	2871	1	PID2 Process Unit Min	DOUBLE	4	x100
P8.1.6	1362	2872	1	PID2 Process Unit Max	DOUBLE	4	x100
P8.1.7	1364	2873	1	PID2 Process Unit Decimal	BYTE	1	x0
P8.1.8	1365	2850	1	PID2 Error Inversion	BOOLEAN	1	x0
P8.1.9	1366	2851	1	PID2 Dead Band	DOUBLE	4	x100
P8.1.10	1368	2852	1	PID2 Dead Band Delay	INTEGER	2	x100
P8.1.11	1373	2151	1	PID2 Ramp Time	INTEGER	2	x100
P8.2.1	2467	NA	NA	PID2 Wake Up Action	BYTE	1	x0
P8.2.2	2546	NA	NA	FB PID2 Set Point 1	DOUBLE	4	x100
P8.2.3	2548	NA	NA	FB PID2 Set Point 2	DOUBLE	4	x100
P8.2.4	2552	NA	NA	FB PID2 Feedback 1	INTEGER	2	x100
P8.2.5	2553	NA	NA	FB PID2 Feedback 2	INTEGER	2	x100
P8.2.6	2556	NA	NA	FB PID2 Feedforward 1	INTEGER	2	x100
P8.2.7	2557	NA	NA	FB PID2 Feedforward 2	INTEGER	2	x100
P8.3.1.1	1369	2170	1	PID2 Keypad Set Point 1	DOUBLE	4	x100
P8.3.1.2	1371	2179	1	PID2 Keypad Set Point 2	DOUBLE	4	x100

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P8.3.1.3	2467	NA	NA	PID2 Wake Up Action	BYTE	1	x0
P8.3.2.1	1374	2110	1	PID2 Set Point 1 Source	BYTE	1	x0
P8.3.2.2	1375	2168	1	PID2 Set Point 1 Min	INTEGER	2	x100
P8.3.2.3	1376	2169	1	PID2 Set Point 1 Max	INTEGER	2	x100
P8.3.2.4	1377	2136	1	PID2 Set Point 1 Sleep Enable	BOOLEAN	1	x0
P8.3.2.5	2398	NA	NA	PID2 Set Point 1 Sleep Unit Sel	BYTE	1	x0
P8.3.2.6	2454	2137	1	PID2 Set Point 1 Sleep Level	DOUBLE	4	x100
P8.3.2.7	1379	2138	1	PID2 Set Point 1 Sleep Delay	INTEGER	2	x0
P8.3.2.8	1380	2139	1	PID2 Set Point 1 WakeUp Level	DOUBLE	4	x100
P8.3.2.9	1382	2154	1	PID2 Set Point 1 Boost	BYTE	1	x10
P8.3.2.10	1414	2830	1	PID2 Set Point1 Comp Enable	BOOLEAN	1	x0
P8.3.2.11	1415	2831	1	PID2 Set Point1 Comp Max	INTEGER	2	x100
P8.3.2.12	2546	NA	NA	FB PID2 Set Point 1	DOUBLE	4	x100
P8.3.3.1	1383	2116	1	PID2 Set Point 2 Source	BYTE	1	x0
P8.3.3.2	1384	2177	1	PID2 Set Point 2 Min	INTEGER	2	x100
P8.3.3.3	1385	2178	1	PID2 Set Point 2 Max	INTEGER	2	x100
P8.3.3.4	1386	2140	1	PID2 Set Point 2 Sleep Enable	BOOLEAN	1	x0
P8.3.3.5	2399	NA	NA	PID2 Set Point 2 Sleep Unit Sel	BYTE	1	x0
P8.3.3.6	2456	2141	1	PID2 Set Point 2 Sleep Level	DOUBLE	4	x100
P8.3.3.7	1388	2142	1	PID2 Set Point 2 Sleep Delay	INTEGER	2	x0
P8.3.3.8	1389	2143	1	PID2 Set Point 2 WakeUp Level	DOUBLE	4	x100
P8.3.3.9	1391	2157	1	PID2 Set Point 2 Boost	BYTE	1	x10
P8.3.3.10	1416	2835	1	PID2 Set Point 2 Comp Enable	BOOLEAN	1	x0
P8.3.3.11	1417	2836	1	PID2 Set Point 2 Comp Max	INTEGER	2	x100
P8.3.3.12	2548	NA	NA	FB PID2 Set Point 2	DOUBLE	4	x100
P8.4.1.1	1392	2171	1	PID2 Feedback Func	BYTE	1	x0
P8.4.1.2	1393	2153	1	PID2 Feedback Gain	INTEGER	2	x10
P8.4.2.1	1394	2112	1	PID2 Feedback 1 Source	BYTE	1	x0
P8.4.2.2	1395	2172	1	PID2 Feedback 1 Min	INTEGER	2	x100
P8.4.2.3	1396	2173	1	PID2 Feedback 1 Max	INTEGER	2	x100
P8.4.2.4	2552	NA	NA	FB PID2 Feedback 1	INTEGER	2	x100
P8.4.3.1	1397	2117	1	PID2 Feedback 2 Source	BYTE	1	x0
P8.4.3.2	1398	2181	1	PID2 Feedback 2 Min	INTEGER	2	x100
P8.4.3.3	1399	2182	1	PID2 Feedback 2 Max	INTEGER	2	x100
P8.4.3.4	2553	NA	NA	FB PID2 Feedback 2	INTEGER	2	x100
P8.5.1.1	1400	2800	1	PID2 Feedforward Func	BYTE	1	x0
P8.5.1.2	1401	2801	1	PID2 Feedforward Gain	INTEGER	2	x10
P8.5.2.1	1402	2810	1	PID2 Feedforward 1 Source	BYTE	1	x0
P8.5.2.2	1403	2811	1	PID2 Feedforward 1 Min	INTEGER	2	x100
P8.5.2.3	1404	2812	1	PID2 Feedforward 1 Max	INTEGER	2	x100
P8.5.2.4	2556	NA	NA	FB PID2 Feedforward 1	INTEGER	2	x100
P8.5.3.1	1405	2815	1	PID2 Feedforward 2 Source	BYTE	1	x0
P8.5.3.2	1406	2816	1	PID2 Feedforward 2 Min	INTEGER	2	x100
P8.5.3.3	1407	2817	1	PID2 Feedforward 2 Max	INTEGER	2	x100
P8.5.3.4	2557	NA	NA	FB PID2 Feedforward 2	INTEGER	2	x100
P9.1	535	640	0	Fire Mode Function	BOOLEAN	1	x0
P9.2	536	438	0	Fire Mode Ref Select Function	BYTE	1	x0
P9.3	537	28	2	Fire Mode Min Frequency	INTEGER	2	x100
P9.4	565	1	5	Fire Mode Freq Ref 1	INTEGER	2	x10
P9.5	564	1	6	Fire Mode Freq Ref 2	INTEGER	2	x10
P9.6	2443	NA	NA	Fire Mode Test Enable	BOOLEAN	1	x0

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P9.7	554	1	11	Smoke Purge Frequency	INTEGER	2	x10
P10.1.1	1418	1801	0	Bypass Enable	BOOLEAN	1	x0
P10.1.2	544	1802	0	Bypass Start Delay	INTEGER	2	x0
P10.1.3	542	1800	1	Auto Bypass	BOOLEAN	1	x0
P10.1.4	543	1802	1	Auto Bypass Delay	INTEGER	2	x0
P10.1.5	547	1803	0	OverCurrent Bypass Enable	BOOLEAN	1	x0
P10.1.6	546	1803	1	IGBT Fault Bypas Enable	BOOLEAN	1	x0
P10.1.7	548	1803	2	4mA Fault Bypass Enable	BOOLEAN	1	x0
P10.1.8	545	1803	3	UnderVoltage Bypass Enable	BOOLEAN	1	x0
P10.1.9	549	1803	4	OverVoltage Bypass Enable	BOOLEAN	1	x0
P10.1.10	1698	NA	NA	Motor OverTemp Bypass Enable	BYTE	1	x0
P10.1.11	1699	NA	NA	UnderLoad Bypass Enable	BYTE	1	x0
P10.1.12	1700	NA	NA	External Bypass Enable	BYTE	1	x0
P10.1.13	1701	NA	NA	Charge Switch Fault Bypass Enable	BYTE	1	x0
P10.1.14	1702	NA	NA	Saturation Trip Fault Bypass Enable	BYTE	1	x0
P10.1.15	1703	NA	NA	Under Temp Fault Bypass Enable	BYTE	1	x0
P10.1.16	1704	NA	NA	EEPROM Fault Bypass Enable	BYTE	1	x0
P10.1.17	1705	NA	NA	FRAM Fault Bypass Enable	BYTE	1	x0
P10.1.18	1706	NA	NA	Watchdog Fault Bypass Enable	BYTE	1	x0
P10.1.19	1707	NA	NA	Fan Cooling Fault Bypass Enable	BYTE	1	x0
P10.1.20	1708	NA	NA	Keypad Com Fault Bypass Enable	BYTE	1	x0
P10.1.21	1709	NA	NA	Option Card Fault Bypass Enable	BYTE	1	x0
P10.1.22	1710	NA	NA	RTC Clock Fault Bypass Enable	BYTE	1	x0
P10.1.23	1711	NA	NA	Ctrl Board OverTemp Fault Bypass Enable	BYTE	1	x0
P10.1.24	1712	NA	NA	Speed Search Start Fault Bypass Enable	BYTE	1	x0
P10.1.25	1713	NA	NA	Fieldbus Fault Bypass Enable	BYTE	1	x0
P10.2.1	2476	NA	NA	Redundant Drive Enable	BYTE	1	x0
P10.2.2	2278	NA	NA	Drive ID	BYTE	1	x0
P10.2.3	2477	NA	NA	Redundant Run Time Enable	BYTE	1	x0
P10.2.4	2478	NA	NA	Redundant Run Time Reset	BYTE	1	x0
P10.2.5	2479	NA	NA	Redundant RunTime Limit	DOUBLE	4	x10
P11.1.1	2487	NA	NA	Interval 1 Setting	BYTE	1	x0
P11.1.2	491	NA	NA	Interval 1 On Time	BYTE	3	x0
P11.1.3	493	NA	NA	Interval 1 Off Time	BYTE	3	x0
P11.1.4	517	3122	0	Interval 1 From Day	BYTE	1	x0
P11.1.5	518	3123	0	Interval 1 To Day	BYTE	1	x0
P11.1.6	519	3124	0	Interval 1 Channel	BYTE	1	x0
P11.2.1	2488	NA	NA	Interval 2 Setting	BYTE	1	x0
P11.2.2	495	NA	NA	Interval 2 On Time	BYTE	3	x0
P11.2.3	497	NA	NA	Interval 2 Off Time	BYTE	3	x0
P11.2.4	520	3122	1	Interval 2 From Day	BYTE	1	x0
P11.2.5	521	3123	1	Interval 2 To Day	BYTE	1	x0
P11.2.6	522	3124	1	Interval 2 Channel	BYTE	1	x0
P11.3.1	2489	NA	NA	Interval 3 Setting	BYTE	1	x0
P11.3.2	499	NA	NA	Interval 3 On Time	BYTE	3	x0
P11.3.3	501	NA	NA	Interval 3 Off Time	BYTE	3	x0
P11.3.4	523	3122	2	Interval 3 From Day	BYTE	1	x0
P11.3.5	524	3123	2	Interval 3 To Day	BYTE	1	x0
P11.3.6	525	3124	2	Interval 3 Channel	BYTE	1	x0
P11.4.1	2490	NA	NA	Interval 4 Setting	BYTE	1	x0
P11.4.2	503	NA	NA	Interval 4 On Time	BYTE	3	x0

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P11.4.3	505	NA	NA	Interval 4 Off Time	BYTE	3	x0
P11.4.4	526	3122	3	Interval 4 From Day	BYTE	1	x0
P11.4.5	527	3123	3	Interval 4 To Day	BYTE	1	x0
P11.4.6	528	3124	3	Interval 4 Channel	BYTE	1	x0
P11.5.1	2491	NA	NA	Interval 5 Setting	BYTE	1	x0
P11.5.2	507	NA	NA	Interval 5 On Time	BYTE	3	x0
P11.5.3	509	NA	NA	Interval 5 Off Time	BYTE	3	x0
P11.5.4	529	3122	4	Interval 5 From Day	BYTE	1	x0
P11.5.5	530	3123	4	Interval 5 To Day	BYTE	1	x0
P11.5.6	531	3124	4	Interval 5 Channel	BYTE	1	x0
P11.6.1	511	3100	0	Timer 1 Duration	DOUBLE	4	x0
P11.6.2	532	3102	0	Timer 1 Channel	BYTE	1	x0
P11.6.3	513	3100	1	Timer 2 Duration	DOUBLE	4	x0
P11.6.4	533	3102	1	Timer 2 Channel	BYTE	1	x0
P11.6.5	515	3100	2	Timer 3 Duration	DOUBLE	4	x0
P11.6.6	534	3102	2	Timer 3 Channel	BYTE	1	x0
P12.1.1	2533	NA	NA	FB Process Data Input 1 Sel	INTEGER	2	x0
P12.1.2	2534	NA	NA	FB Process Data Input 2 Sel	INTEGER	2	x0
P12.1.3	2535	NA	NA	FB Process Data Input 3 Sel	INTEGER	2	x0
P12.1.4	2536	NA	NA	FB Process Data Input 4 Sel	INTEGER	2	x0
P12.1.5	2537	NA	NA	FB Process Data Input 5 Sel	INTEGER	2	x0
P12.1.6	2538	NA	NA	FB Process Data Input 6 Sel	INTEGER	2	x0
P12.1.7	2539	NA	NA	FB Process Data Input 7 Sel	INTEGER	2	x0
P12.1.8	2540	NA	NA	FB Process Data Input 8 Sel	INTEGER	2	x0
P12.2.1	1556	442	0	FB Process Data Output 1 Sel	INTEGER	2	x0
P12.2.2	1557	442	1	FB Process Data Output 2 Sel	INTEGER	2	x0
P12.2.3	1558	442	2	FB Process Data Output 3 Sel	INTEGER	2	x0
P12.2.4	1559	442	3	FB Process Data Output 4 Sel	INTEGER	2	x0
P12.2.5	1560	442	4	FB Process Data Output 5 Sel	INTEGER	2	x0
P12.2.6	1561	442	5	FB Process Data Output 6 Sel	INTEGER	2	x0
P12.2.7	1562	442	6	FB Process Data Output 7 Sel	INTEGER	2	x0
P12.2.8	1563	442	7	FB Process Data Output 8 Sel	INTEGER	2	x0
P12.2.9	2415	NA	NA	Standard Status Word Bit0 Function Select	BYTE	1	x0
P12.2.10	2416	NA	NA	Standard Status Word Bit1 Function Select	BYTE	1	x0
P12.2.11	2417	NA	NA	Standard Status Word Bit2 Function Select	BYTE	1	x0
P12.2.12	2418	NA	NA	Standard Status Word Bit3 Function Select	BYTE	1	x0
P12.2.13	2419	NA	NA	Standard Status Word Bit4 Function Select	BYTE	1	x0
P12.2.14	2420	NA	NA	Standard Status Word Bit5 Function Select	BYTE	1	x0
P12.2.15	2421	NA	NA	Standard Status Word Bit6 Function Select	BYTE	1	x0
P12.2.16	2422	NA	NA	Standard Status Word Bit7 Function Select	BYTE	1	x0
P12.3.1.1	586	3220	0	RS485 Comm Set	BYTE	1	x0
P12.3.2.1	587	3221	0	Slave Address	BYTE	1	x0
P12.3.2.2	584	3222	0	Baud Rate	BYTE	1	x0
P12.3.2.3	585	3224	0	Parity Type	BYTE	1	x0
P12.3.2.4	588	3225	0	Modbus RTU Protocol Status	BYTE	1	x0
P12.3.2.5	593	3290	0	Comm Timeout Modbus RTU	INTEGER	2	x0
P12.3.2.6	2516	NA	NA	Modbus RTU Fault Response	BYTE	1	x0
P12.3.3.1	594	NA	NA	MSTP Baud Rate	BYTE	1	x0
P12.3.3.2	595	NA	NA	MSTP Device Address	BYTE	1	x0
P12.3.3.3	596	NA	NA	MSTP Instance Number	DOUBLE	4	x0
P12.3.3.4	598	NA	NA	MSTP Comm Timeout	INTEGER	2	x0

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P12.3.3.5	599	NA	NA	MSTP Protocol Status	BYTE	1	x0
P12.3.3.6	600	NA	NA	MSTP Fault Code	BYTE	1	x0
P12.3.3.7	2526	NA	NA	MSTP Fault Response	BYTE	1	x0
P12.3.3.8	1537	NA	NA	MSTP Max Master	BYTE	1	x0
P12.4.1.1	1500	3249	0	IP Address Mode	BOOLEAN	1	x0
P12.4.1.2	1507	NA	NA	Active IP Address	BYTE	4	x0
P12.4.1.3	1509	NA	NA	Active Subnet Mask	BYTE	4	x0
P12.4.1.4	1511	NA	NA	Active Default Gateway	BYTE	4	x0
P12.4.1.5	1513	NA	NA	MAC Address	BYTE	6	x0
P12.4.1.6	1501	NA	NA	Static IP Address	BYTE	4	x0
P12.4.1.7	1503	NA	NA	Static Subnet Mask	BYTE	4	x0
P12.4.1.8	1505	NA	NA	Static Default Gateway	BYTE	4	x0
P12.4.1.9	1725	NA	NA	Enable BACnetIP	BYTE	1	X0
P12.4.2.1	609	NA	NA	Connection Limit	BYTE	1	x0
P12.4.2.2	610	NA	NA	Modbus TCP Unit ID	BYTE	1	x0
P12.4.2.3	611	NA	NA	Comm Timeout Modbus TCP	INTEGER	2	x0
P12.4.2.4	612	3235	0	Modbus TCP Protocol Status	BYTE	1	x0
P12.4.2.5	2517	NA	NA	Modbus TCP Fault Response	BYTE	1	x0
P12.4.3.1	1733	NA	NA	BACnet IP UDP port number	INTEGER	2	x0
P12.4.3.2	1734	NA	NA	BACnet IP Foreign Device	BYTE	1	x0
P12.4.3.3	1735	NA	NA	BACnet IP BBMD IP	BYTE	4	x0
P12.4.3.4	1737	NA	NA	BACnet IP BBMD Port	INTEGER	2	x0
P12.4.3.5	1738	NA	NA	BACnet IP Registration Interval	INTEGER	2	x0
P12.4.3.6	1739	NA	NA	BACnet IP Comm Timeout	INTEGER	2	x0
P12.4.3.7	1740	NA	NA	BACnet IP Protocol Status	BYTE	1	x0
P12.4.3.8	1741	NA	NA	BACnet IP Fault Behavior	BYTE	1	x0
P12.4.3.9	1742	NA	NA	BACnetIP Instance Number	DOUBLE	4	x0
P13.1.1	340	323	0	Language	BYTE	1	x0
P13.1.2	142	256	0	Application	BYTE	1	x0
P13.1.3	619	970	0	Parameter Sets	BYTE	1	x0
P13.1.4	620	302	0	Up To Keypad	BOOLEAN	1	x0
P13.1.5	621	302	1	Down From Keypad	BYTE	1	x0
P13.1.6	623	305	0	Parameter Comparison	BYTE	1	x0
P13.1.7	624	320	0	Password	INTEGER	2	x0
P13.1.8	625	625	0	Parameter Lock	BOOLEAN	1	x0
P13.1.9	627	328	0	Multimonitor Set	BOOLEAN	1	x0
P13.1.10	628	326	0	Default Page	BYTE	1	x0
P13.1.11	629	330	0	Timeout Time	INTEGER	2	x0
P13.1.12	630	324	0	Contrast Adjust	BYTE	1	x0
P13.1.13	631	330	1	Backlight Time	INTEGER	2	x0
P13.1.14	632	627	0	Fan Control	BYTE	1	x0
P13.1.15	633	362	0	Keypad ACK Timeout	INTEGER	2	x0
P13.1.16	634	3291	0	Keypad Retry Number	BYTE	1	x0
P13.1.17	626	NA	NA	Startup Wizard	BOOLEAN	1	x0
P13.1.18	2412	NA	NA	Jog Softkey Hidden	BYTE	1	x0
P13.1.19	2413	NA	NA	Reverse Softkey Hidden	BYTE	1	x0
P13.1.20	2424	NA	NA	Output Display Unit	BYTE	1	x0
P13.1.21	2460	NA	NA	Output Display Unit Min	DOUBLE	4	x100
P13.1.22	2425	NA	NA	Output Display Unit Max	DOUBLE	4	x100
P13.2.1	640	207	2	Keypad Software Version	INTEGER	4	x0
P13.2.2	642	206	0	Motor Control Software Version	INTEGER	4	x0

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
P13.2.3	644	207	1	Application Software Version	INTEGER	4	x0
P13.2.4	1714	NA	NA	Software Bundle Version		20	x0
P13.3.1	646	2206	0	Brake Chopper	BOOLEAN	1	x0
P13.3.2	647	2200	0	Brake Resistor Status	BOOLEAN	1	x0
P13.3.3	648	NA	NA	Serial Number	DOUBLE	4	x0
P13.4.1	566	3000	0	Real Time Clock	BYTE	6	x0
P13.4.2	582	3001	0	Daylight Saving	BYTE	1	x0
P13.4.3	601	520	2	Total MWh Count	DOUBLE	4	x10000
P13.4.4	603	522	0	Total Power Day Count	INTEGER	2	x0
P13.4.5	606	821	1	Total Power Hr Count	DOUBLE	4	x0
P13.4.6	604	806	0	Trip MWh Count	DOUBLE	4	x10000
P13.4.7	635	322	3	Clear Trip MWh Count	BOOLEAN	1	x0
P13.4.8	636	870	0	Trip Power Day Count	INTEGER	2	x0
P13.4.9	637	871	0	Trip Power Hr Count	DOUBLE	4	x0
P13.4.10	639	322	4	Clear Trip Power Count	BOOLEAN	1	x0
B2.1.1	883	710	1	Board Status	BYTE	1	x0
B2.1.2	1064	NA	NA	Firmware Version	INTEGER	4	x0
B2.1.3	889	760	3	DI1, DI2, DI3	BYTE	1	x0
B2.1.4	888	761	3	DO1, DO2, DO3	BYTE	1	x0
B2.1.5	891	593	100	Thermistor Resistor	DOUBLE	4	x0
B2.1.6	887	753	100	Thermistor State	BYTE	1	x0
B2.2.1	241	461	100	DO1 Function	BYTE	1	x0
B2.2.2	242	461	101	DO2 Function	BYTE	1	x0
B2.2.3	243	461	102	DO3 Function	BYTE	1	x0
B2.2.4	890	343	100	Thermistor Config	BOOLEAN	1	x0
B3.1.1	883	710	1	Board Status	BYTE	1	x0
B3.1.2	1064	NA	NA	Firmware Version	INTEGER	4	x0
B3.1.3	894	560	100	AI1 Value	INTEGER	2	x1000
B3.1.4	897	570	100	AO1 Value	INTEGER	2	x1000
B3.1.5	899	570	101	AO2 Value	INTEGER	2	x1000
B3.2.1	893	263	100	AI1 Mode	BYTE	1	x0
B3.2.2	124	260	100	AI1 Signal Range	BYTE	1	x0
B3.2.3	125	264	100	AI1 Custom Min	INTEGER	2	x100
B3.2.4	126	265	100	AI1 Custom Max	INTEGER	2	x100
B3.2.5	123	266	100	AI1 Filter Time	INTEGER	2	x100
B3.2.6	127	267	100	AI1 Signal Invert	BOOLEAN	1	x0
B3.2.7	896	276	100	AO1 Mode	BYTE	1	x0
B3.2.8	235	460	100	AO1 Function	BYTE	1	x0
B3.2.9	238	279	100	AO1 Minimum	BYTE	1	x0
B3.2.10	236	277	100	AO1 Filter Time	INTEGER	2	x100
B3.2.11	239	274	100	AO1 Scale	INTEGER	2	x0
B3.2.12	237	278	100	AO1 Inversion	BOOLEAN	1	x0
B3.2.13	240	275	100	AO1 Offset	INTEGER	2	x100
B3.2.14	898	276	101	AO2 Mode	BYTE	1	x0
B3.2.15	269	460	101	AO2 Function	BYTE	1	x0
B3.2.16	270	279	101	AO2 Minimum	BYTE	1	x0
B3.2.17	271	277	101	AO2 Filter Time	INTEGER	2	x100
B3.2.18	272	274	101	AO2 Scale	INTEGER	2	x0
B3.2.19	273	278	101	AO2 Inversion	BOOLEAN	1	x0
B3.2.20	274	275	101	AO2 Offset	INTEGER	2	x100
B4.1.1	883	710	1	Board Status	BYTE	1	x0

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
B4.1.2	1064	NA	NA	Firmware Version	INTEGER	4	x0
B4.1.3	900	455	100	RO1, RO2, RO3	BYTE	1	x0
B4.2.1	540	451	100	RO1 Function	BYTE	1	x0
B4.2.2	541	451	101	RO2 Function	BYTE	1	x0
B4.2.3	551	451	102	RO3 Function	BYTE	1	x0
B5.1.1	883	710	1	Board Status	BYTE	1	x0
B5.1.2	1064	NA	NA	Firmware Version	INTEGER	4	x0
B5.1.3	905	756	100	PT100 State	INTEGER	6	x0
B5.1.4	902	NA	NA	PT100 Values	INTEGER	6	x10
B5.2.1	901	342	100	PT100-3,2,1	BYTE	1	x0
B5.2.2	338	581	100	PT100 Warning Limit	INTEGER	2	x10
B5.2.3	339	582	100	PT100 Fault Limit	INTEGER	2	x10
B6.1.1	883	710	1	Board Status	BYTE	1	x0
B6.1.2	1064	NA	NA	Firmware Version	INTEGER	4	x0
B6.1.3	908	760	3	AC1, AC2, AC3	BYTE	1	x0
B6.1.4	1696	760	7	AC4, AC5, AC6	BYTE	1	x0
B7.1.1.1	883	710	1	Board Status	BYTE	1	x0
B7.1.1.2	1064	NA	NA	Firmware Version	INTEGER	4	x0
B7.1.1.3	2131	NA	NA	Protocol Status	BYTE	1	x0
B7.1.1.4	NA	NA	NA	PDP-Telegram Selection	INTEGER	2	x0
B7.1.1.5	NA	NA	NA	Fault Counter PDP	INTEGER	2	x0
B7.1.1.6	NA	NA	NA	Fault Situations Max	INTEGER	4	x0
B7.1.1.7	NA	NA	NA	PDP-Profil Number	INTEGER	2	x0
B7.1.1.8	NA	NA	NA	PDP-Control Word	INTEGER	2	x0
B7.1.1.9	NA	NA	NA	PDP-Status Word	INTEGER	2	x0
B7.1.2.1	2621	NA	NA	PDP-MaxBlockLength	BYTE	1	x0
B7.1.2.2	2622	NA	NA	PDP-NoOfMultiparameter	BYTE	1	x0
B7.1.2.3	2623	NA	NA	PDP-MaxLatency	BYTE	1	x0
B7.1.3.1	2624	NA	NA	PDP-DO Manufacturer	INTEGER	2	x0
B7.1.3.2	1451	NA	NA	PDP-DO Device Type	INTEGER	2	x0
B7.1.3.3	NA	NA	NA	PDP-DO FW-Interface	INTEGER	2	x0
B7.1.3.4	NA	NA	NA	PDP-DO FW-Year	INTEGER	2	x0
B7.1.3.5	NA	NA	NA	PDP-DO FW-DayMonth	INTEGER	2	x0
B7.1.3.6	2628	NA	NA	PDP-DO NoOfDOs	BYTE	1	x0
B7.1.3.7	2629	NA	NA	PDP-DO Subclass	BYTE	1	x0
B7.2.1	1242	3201	100	Slave Address	BYTE	1	x0
B7.2.2	1243	3202	100	Baud Rate	BYTE	1	x0
B7.2.3	1245	3200	100	Operate Mode	BYTE	1	x0
B7.2.4	NA	NA	NA	Parameter Access	INTEGER	2	x0
B7.2.5	NA	NA	NA	Process Data Access	INTEGER	2	x0
B7.2.6	NA	NA	NA	Fault Situation Counter	INTEGER	2	x0
B7.2.7	619	970	0	Parameter Sets	BYTE	1	x0
B8.1.1	883	710	1	Board Status	BYTE	1	x0
B8.1.2	1064	NA	NA	Firmware Version	INTEGER	4	x0
B8.1.3	2132	NA	NA	Protocol Status	BYTE	1	x0
B8.2.1	2133	NA	NA	Node ID	BYTE	1	x0
B8.2.2	2134	NA	NA	Baud Rate	BYTE	1	x0
B8.2.3	2135	NA	NA	Operate Mode	BYTE	1	x0
B8.2.4	2519	NA	NA	Comm Card FB Fault Response	BYTE	1	x0
B9.1.1	883	710	1	Board Status	BYTE	1	x0
B9.1.2	1064	NA	NA	Firmware Version	INTEGER	4	x0

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
B9.1.3	2136	NA	NA	Protocol Status	BYTE	1	x0
B9.2.1	2137	NA	NA	MAC ID	BYTE	1	x0
B9.2.2	2138	NA	NA	Baud Rate	BYTE	1	x0
B9.2.3	2187	NA	NA	IO Poll Type	BYTE	1	x0
B9.2.4	2212	NA	NA	Dnet Comm Timeout	INTEGER	2	x0
B9.2.5	2519	NA	NA	Comm Card FB Fault Response	BYTE	1	x0
B11.1.1	910	710	2	Board Status	BYTE	1	x0
B11.1.2	1067	NA	NA	Firmware Version	INTEGER	4	x0
B11.1.3	915	550	200	DI1, DI2, DI3	BYTE	1	x0
B11.1.4	914	761	2	DO1, DO2, DO3	BYTE	1	x0
B11.1.5	917	593	200	Thermistor Resistor	DOUBLE	4	x0
B11.1.6	913	753	200	Thermistor State	BYTE	1	x0
B11.2.1	244	461	200	DO1 Function	BYTE	1	x0
B11.2.2	245	461	201	DO2 Function	BYTE	1	x0
B11.2.3	246	461	202	DO3 Function	BYTE	1	x0
B11.2.4	916	343	200	Thermistor Config	BYTE	1	x0
B12.1.1	910	710	2	Board Status	BYTE	1	x0
B12.1.2	1067	NA	NA	Firmware Version	INTEGER	4	x0
B12.1.3	920	560	200	AI1 Value	INTEGER	2	x1000
B12.1.4	923	570	200	AO1 Value	INTEGER	2	x1000
B12.1.5	925	570	201	AO2 Value	INTEGER	2	x1000
B12.2.1	919	NA	NA	AI1 Mode	BYTE	1	x0
B12.2.2	129	260	200	AI1 Signal Range	BYTE	1	x0
B12.2.3	130	264	200	AI1 Custom Min	INTEGER	2	x100
B12.2.4	131	265	200	AI1 Custom Max	INTEGER	2	x100
B12.2.5	128	266	200	AI1 Filter Time	INTEGER	2	x100
B12.2.6	132	267	200	AI1 Signal Invert	BOOLEAN	1	x0
B12.2.7	922	276	200	AO1 Mode	BYTE	1	x0
B12.2.8	275	460	200	AO1 Function	BYTE	1	x0
B12.2.9	276	279	200	AO1 Minimum	BYTE	1	x0
B12.2.10	277	277	200	AO1 Filter Time	INTEGER	2	x100
B12.2.11	278	274	200	AO1 Scale	INTEGER	2	x0
B12.2.12	279	278	200	AO1 Inversion	BOOLEAN	1	x0
B12.2.13	280	275	200	AO1 Offset	INTEGER	2	x100
B12.2.14	924	276	201	AO2 Mode	BYTE	1	x0
B12.2.15	281	460	201	AO2 Function	BYTE	1	x0
B12.2.16	282	279	201	AO2 Minimum	BYTE	1	x0
B12.2.17	283	277	201	AO2 Filter Time	INTEGER	2	x100
B12.2.18	284	274	201	AO2 Scale	INTEGER	2	x0
B12.2.19	285	278	201	AO2 Inversion	BOOLEAN	1	x0
B12.2.20	286	275	201	AO2 Offset	INTEGER	2	x100
B13.1.1	910	710	2	Board Status	BYTE	1	x0
B13.1.2	1067	NA	NA	Firmware Version	INTEGER	4	x0
B13.1.3	926	762	2	RO1, RO2, RO3	BYTE	1	x0
B13.2.1	552	451	200	RO1 Function	BYTE	1	x0
B13.2.2	555	451	201	RO2 Function	BYTE	1	x0
B13.2.3	556	451	202	RO3 Function	BYTE	1	x0
B14.1.1	910	710	2	Board Status	BYTE	1	x0
B14.1.2	1067	NA	NA	Firmware Version	INTEGER	4	x0
B14.1.3	931	757	2	PT100 State	INTEGER	6	x0
B14.1.4	928	NA	NA	PT100 Values	INTEGER	6	x10

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
B14.2.1	927	342	200	PT100-3,2,1	BYTE	1	x0
B14.2.2	937	581	200	PT100 Warning Limit	INTEGER	2	x10
B14.2.3	938	582	200	PT100 Fault Limit	INTEGER	2	x10
B15.1.1	910	710	2	Board Status	BYTE	1	x0
B15.1.2	1067	NA	NA	Firmware Version	INTEGER	4	x0
B15.1.3	934	760	4	AC1, AC2, AC3	BYTE	1	x0
B15.1.4	1697	760	8	AC4, AC5, AC6	BYTE	1	x0
B16.1.1.1	910	710	2	Board Status	BYTE	1	x0
B16.1.1.2	1067	NA	NA	Firmware Version	INTEGER	4	x0
B16.1.1.3	2142	NA	NA	Protocol Status	BYTE	1	x0
B16.1.1.4	NA	NA	NA	PDP-Telegram Selection	INTEGER	2	x0
B16.1.1.5	NA	NA	NA	Fault Counter PDP	INTEGER	2	x0
B16.1.1.6	NA	NA	NA	Fault Situations Max	INTEGER	4	x0
B16.1.1.7	NA	NA	NA	PDP-Profil Number	INTEGER	2	x0
B16.1.1.8	NA	NA	NA	PDP-Control Word	INTEGER	2	x0
B16.1.1.9	NA	NA	NA	PDP-Status Word	INTEGER	2	x0
B16.1.2.1	2621	NA	NA	PDP-MaxBlockLength	BYTE	1	x0
B16.1.2.2	2622	NA	NA	PDP-NoOfMultiparameter	BYTE	1	x0
B16.1.2.3	2623	NA	NA	PDP-MaxLatency	BYTE	1	x0
B16.1.3.1	2624	NA	NA	PDP-DO Manufacturer	INTEGER	2	x0
B16.1.3.2	1451	NA	NA	PDP-DO Device Type	INTEGER	2	x0
B16.1.3.3	2625	NA	NA	PDP-DO FW-Interface	INTEGER	2	x0
B16.1.3.4	NA	NA	NA	PDP-DO FW-Year	INTEGER	2	x0
B16.1.3.5	NA	NA	NA	PDP-DO FW-DayMonth	INTEGER	2	x0
B16.1.3.6	2628	NA	NA	PDP-DO NoOfDOs	BYTE	1	x0
B16.1.3.7	2629	NA	NA	PDP-DO Subclass	BYTE	1	x0
B16.2.1	1250	3201	200	Slave Address	BYTE	1	x0
B16.2.2	1251	3202	200	Baud Rate	BYTE	1	x0
B16.2.3	1253	3200	200	Operate Mode	BYTE	1	x0
B16.2.4	NA	NA	NA	Parameter Access	INTEGER	2	x0
B16.2.5	NA	NA	NA	Process Data Access	INTEGER	2	x0
B16.2.6	NA	NA	NA	Fault Situation Counter	INTEGER	2	x0
B16.2.7	619	970	0	Parameter Sets	BYTE	1	x0
B17.1.1	910	710	2	Board Status	BYTE	1	x0
B17.1.2	1067	NA	NA	Firmware Version	INTEGER	4	x0
B17.1.3	2143	NA	NA	Protocol Status	BYTE	1	x0
B17.2.1	2144	NA	NA	Node ID	BYTE	1	x0
B17.2.2	2145	NA	NA	Baud Rate	BYTE	1	x0
B17.2.3	2146	NA	NA	Operate Mode	BYTE	1	x0
B17.2.4	2520	NA	NA	Comm Card FB Fault Response	BYTE	1	x0
B18.1.1	910	710	2	Board Status	BYTE	1	x0
B18.1.2	1067	NA	NA	Firmware Version	INTEGER	4	x0
B18.1.3	2147	NA	NA	Protocol Status	BYTE	1	x0
B18.2.1	2148	NA	NA	MAC ID	BYTE	1	x0
B18.2.2	2149	NA	NA	Baud Rate	BYTE	1	x0
B18.2.3	2188	NA	NA	IO Poll Type	BYTE	1	x0
B18.2.4	2212	NA	NA	Dnet Comm Timeout	INTEGER	2	x0
B18.2.5	2520	NA	NA	Comm Card FB Fault Response	BYTE	1	x0
O1	1	502	0	Output Frequency	INTEGER	2	x100
O2	24	1	0	Freq Reference	INTEGER	2	x100
O3	2	503	0	Motor Speed	INTEGER	2	x0

Table 206. DH1 Parameter ID list, continued

Menu Item No.	Modbus Register	PROFIBUS PNU	PROFIBUS PNU SubIndex	Parameter Description	Data Type	Length (in Bytes)	Display Format
O4	3	504	0	Motor Current	INTEGER	2	x10
O5	4	507	0	Motor Torque	INTEGER	2	x10
O6	5	513	1	Motor Power	INTEGER	2	x10
O7	6	501	0	Motor Voltage	INTEGER	2	x10
O8	7	501	1	DC-link Voltage	INTEGER	2	x0
O9	8	822	6	Unit Temperature	INTEGER	2	x10
O10	9	822	4	Motor Temperature	INTEGER	2	x10
R11	141	1	8	Keypad Reference	INTEGER	2	x100
R12	1307	2170	0	PID1 Keypad Set Point 1	DOUBLE	4	x100
R13	1309	2179	0	PID1 Keypad Set Point 2	DOUBLE	4	x100
	142	256	0	Application	BYTE	1	x0
	340	323	0	Language	BYTE	1	x0
	566	3000	0	Real Time Clock	BYTE	6	x0
	582	3001	0	Daylight Saving	BYTE	1	x0
	101	20	0	Min Frequency	INTEGER	2	x100
	102	20	1	Max Frequency	INTEGER	2	x100
	486	210	0	Motor Nom Current	INTEGER	2	x10
	107	281	0	Current Limit	INTEGER	2	x10
	489	217	0	Motor Nom Speed	INTEGER	2	x0
R13	490	215	0	Motor PF	INTEGER	2	x100
	487	211	0	Motor Nom Voltage	INTEGER	2	x0
	488	216	0	Motor Nom Frequency	INTEGER	2	x100
	103	130	0	Accel Time 1	INTEGER	2	x10
	104	134	0	Decel Time 1	INTEGER	2	x10
	1695	NA	NA	Hand Control Place	BYTE	1	x0
	136	436	0	Hand Reference	BYTE	1	x0
	135	408	0	Auto 1 Control Place	BYTE	1	x0
	137	437	0	Auto 1 Reference	BYTE	1	x0
	1297	2870	0	PID1 Process Unit	BYTE	1	x0
	1298	2871	0	PID1 Process Unit Min	DOUBLE	4	x100
	1300	2872	0	PID1 Process Unit Max	DOUBLE	4	x100
	1312	2110	0	PID1 Set Point 1 Source	BYTE	1	x0
	1307	2170	0	PID1 Keypad Set Point 1	DOUBLE	4	x100
	1332	2112	0	PID1 Feedback 1 Source	BYTE	1	x0
	1333	2172	0	PID1 Feedback 1 Min	INTEGER	2	x100
	1334	2173	0	PID1 Feedback 1 Max	INTEGER	2	x100
	1297	2870	0	PID1 Process Unit	BYTE	1	x0
	1298	2871	0	PID1 Process Unit Min	DOUBLE	4	x100
	1300	2872	0	PID1 Process Unit Max	DOUBLE	4	x100
	1312	2110	0	PID1 Set Point 1 Source	BYTE	1	x0
	1307	2170	0	PID1 Keypad Set Point 1	DOUBLE	4	x100
	1332	2112	0	PID1 Feedback 1 Source	BYTE	1	x0
	1333	2172	0	PID1 Feedback 1 Min	INTEGER	2	x100
	1334	2173	0	PID1 Feedback 1 Max	INTEGER	2	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 207. 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	Motor speed	rpm	1 rpm	
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			

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

Data	Value	Unit	Scale	Default
Process Data in 1	FB Torque Reference	%	0.01	0
Process Data in 2	FB Setpoint 1	varies	varies	0
Process Data in 3	FB Feedback 1	varies	varies	0
Process Data in 4	Accel Time 1	s	0.1	varies
Process Data in 5	Decel Tiime 1	s	0.1	varies
Process Data in 6	Current Limit	A	0.1	varies
Process Data in 7	Not Assigned	—	—	—
Process Data in 8	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
P20.1.1	FB Data Out 1 Sel	1	Output Frequency
P20.1.2	FB Data Out 2 Sel	2	Motor Speed
P20.1.3	FB Data Out 3 Sel	3	Motor Current
P20.1.4	FB Data Out 4 Sel	4	Motor Torque
P20.1.5	FB Data Out 5 Sel	5	Motor Power
P20.1.6	FB Data Out 6 Sel	6	Motor Voltage
P20.1.7	FB Data Out 7 Sel	7	DC-link Voltage
P20.1.8	FB Data Out 8 Sel	8	Unit Temperature

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 an 8 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 209. Fault code list

Fault Code	Fault Name	Fault type	Default	Realization	CIP Fault code	PROFIdrive fault code
1	Over current	Fault		DSP	0x2310h	8976
2	Over voltage	Fault		DSP	0x3210h	12816
3	Earth vault	Configurable	Fault	DSP	0x2330h	9008
5	Charging switch	Fault		DSP	0xA000h	12849
6	Emergency stop	Fault		MCU	0xA001h	21121
7	Saturation trip	Fault		DSP	0xA002h	29040
9	UnderVoltage	Configurable	Fault	DSP/MCU	0x3220h	12576
10	Input Phase Spv	Configurable	Fault	DSP	0xA004h	8528
11	Output Phase Spv	Configurable	Fault	DSP	0xA005h	9040
12	BrakeChopperSpv	Fault		DSP	0x7110h	28944
13	Drive underTemp	Configurable	Warning	DSP	0x4320h	16928
14	Drive overTemp	Fault		DSP	0x4310h	16912
15	Motor stalled	Configurable	No Action	DSP	0x7121h	28963
16	Motor overTemp	Configurable	No Action	DSP	0x4210h	17168
17	Motor underLoad	Configurable	No Action	DSP	29d	28979
18	IP address conflict	Configurable	Warning	MCU	0xA006h	30070
19	Power board EEPROM fault	Fault		MCU	0xA007h	21795
20	FRAM fault	Fault		MCU	0xA008h	21777
21	Serial flash fault	warning		MCU	0xA009h	21796
25	MCU WatchDog fault	Fault		MCU	0x6010h	24848
26	Start-up prevent	Fault		MCU	0xA00Ah	35585
29	Thermistor fault	Configurable	Fault	MCU	0x7300h	28978
32	Fan cooling	Fault		DSP	0xA00Bh	28689
36	Compatibility fault	Fault		MCU	0x5200h	24849
37	Device change	Warning		MCU	0xA00Ch	35360
38	Device added	Warning		MCU	0xA00Dh	35361
39	Device removed	Fault		MCU	0xA00Eh	35362
40	Device Unknown	Fault		MCU	0xA00Fh	35363
41	IGBT temperature	Fault		DSP	66d	16913
50	AIN<4mA(4to20mA)	Configurable	No Action	MCU	0xA011h	29520
51	External fault	Configurable	Fault	MCU	0x9000h	36864
52	Keypad communication fault	Configurable	Fault	MCU	0xA012h	21264
54	OPT card fault	Configurable	Fault	MCU	0xA013h	35073
55	Real time clock fault	Configurable	Warning	MCU	0xA015h	35344
56	PT100 fault	Configurable	Fault	MCU	0xA016h	29536
57	Motor ID fault	Fault		DSP	0xA017h	29072
59	Possible power wiring error detected	Fault		DSP	0x5400h	37121
58	Current measure fault	Fault		DSP	0x2100h	9217
60	Control board overtemp	Fault		DSP	0x4300h	16914
61	Internal-ctrl supply	Fault		MCU	0x5112h	20737
62	Too many speed search restarts	Fault		DSP	0xA018h	33809
63	Current unbalance	Fault		DSP	26d	9056
64	Replace battery	Configurable	Warning	MCU	0xA019h	35345
65	Replace fan	Configurable	Warning	MCU	0xA01Ah	28688
66	Safety torque off	Fault		DSP	0xA01Bh	21665

Table 209. Fault code list, continued

Fault Code	Fault Name	Fault type	Default	Realization	CIP Fault code	PROFIdrive fault code
67	Current limit control	Warning		DSP	0x2200h	8977
68	Over voltage control	Warning		DSP	0x3310h	12817
69	System Fault - Thermistor SPI	Fault		MCU	0xA01Ch	21009
70	System Fault - DSP Parameter	Fault		MCU	0xA01Dh	22018
71	System Fault - Intercom	Fault		MCU	0xA01Eh	22019
72	Power board EEPROM fault	Fault		MCU	0xA01Fh	22305
73	Internal FRAM	Fault		MCU	0xA020h	22033
74	FRAM data error	Fault		MCU	0xA021h	21809
75	Internal power board EEPROM fault	Fault		MCU	0xA022h	22035
76	EEPROM Data error	Fault		MCU	0xA023h	21808
77	Internal serial flash	Fault		MCU	0xA024h	22051
82	Bypass overload	Fault		MCU	0xA025h	28980
83	FieldBus fault	Configurable	Fault	MCU	0xA026h	30064
84	FieldBus fault	Configurable	Fault	MCU	0xA027h	30065
85	FieldBus fault	Configurable	Fault	MCU	0xA028h	30066
86	FieldBus fault	Configurable	Fault	MCU	0x8100h	30067
87	FieldBus fault	Configurable	Fault	MCU	0xA029h	30068
88	FieldBus fault	Configurable	Fault	MCU	0xA02Ah	30069
89	Under voltage	Fault		DSP	0xA02Bh	30070
90	Drive UnderTemp	Warning/Fault		DSP	0x3221h	30071
91	Option card fault	Fault		MCU	0xA02Ch	30072
92	External fault 2	Configurable	Fault	MCU	0xA02Dh	NA
93	External fault 3	Configurable	Fault	MCU	0xA02Eh	NA
94	Pump lost	Warning		MCU	0xA02Fh	58881
95	Need alternation	Warning		MCU	0xA030	58882
96	Parameter error	Warning		MCU	0x6320	33072
97	Prime loss	Configurable	No Action	MCU	0xA031	35587
98	PID1 feedback AI loss	Configurable	No Action	MCU	0xA032	33283
99	PID2 feedback AI loss	Configurable	No Action	MCU	0xA033	33284
100	FieldBus SMDT Fault	Configurable	Fault	MCU	0xA034	30002
101	SMDT card fault	Configurable		MCU	0xA035	35120
102	External Fault from SWD	Configurable	Fault	MCU	0xA036	36871
103	Drive OverTemp Warning	Warning		DSP	0xA037	16912
104	Compatibility Fault	Warning		MCU	0xA038	22529
105	Compatibility Fault	Warning		MCU	0xA039	22532
106	Compatibility Fault	Warning		MCU	0xA03A	22785
107	Compatibility Fault	Warning		MCU	0xA03B	22786
108	Compatibility Fault	Warning		MCU	0xA03C	22784
109	Compatibility Fault	Warning		MCU	0xA03D	22787
110	Compatibility Fault	Warning		MCU	0xA03E	22788
111	Compatibility Fault	Warning		MCU	0xA03F	22792
112	Compatibility Fault	Warning		MCU	0xA040	22806
113	Compatibility Fault	Warning		MCU	0xA041	22789
114	Compatibility Fault	Warning		MCU	0xA042	22791

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

This section "secure configuration" or "hardening" guidelines provide information to the users to securely deploy and maintain this product to adequately minimize the cybersecurity risks to their system. Eaton is committed to minimizing the Cybersecurity risk in its products and deploys cybersecurity best practices and latest cybersecurity technologies in its products and solutions; making them more secure, reliable and competitive for our customers. Eaton also offers Cybersecurity Best Practices whitepapers to its customers that can be referenced at www.eaton.com/cybersecurity

Table 210. PowerXL—secure configuration guidelines

Category	Description
Asset identification and inventory	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 PowerXL Series VFD 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 • Device Name Information specific to communication protocols is available form parameter menu as below • IP Address Mode • Active IP Address • MAC Address See application manual for these parameter locations.
Restrict physical access	Industrial Control Protocols don't offer cryptographic protections at protocol level leaving them exposed to Cybersecurity risk. Physical security is an important layer of defense in such cases. PowerXL Series VFD is designed with the consideration that it would be deployed and operated in a physically secure location. • Eaton suggests that physical access to cabinets and/or enclosures containing PowerXL Series VFD and the associated system should be restricted, monitored and logged at all times. • Physical access to the communication lines should be restricted to prevent any attempts of wiretapping, sabotage. It's a best practice to use metal conduits for the communication lines running between one cabinet to another cabinet. • Attacker with unauthorized physical access to the device could cause serious disruption of the device functionality. A combination of physical access controls to the location should be used, such as locks, card readers, and/or guards etc. • PowerXL Series VFD supports the following physical access ports, ◦ RJ45 connector for removable keypad as well as Modbus RTU communications ◦ RJ45 for EtherNet IP/Modbus TCP communications ◦ Terminal block for Modbus RTU and other Digital IOs Eaton suggests access to above physical ports need to be restricted.

Table 210. PowerXL—secure configuration guidelines, continued

Category	Description
Restrict logical access to PowerXL Series drive	It is extremely important to securely configure the logical access mechanisms provided in PowerXL Series VFD to safeguard the device from unauthorized access. PowerXL Series VFD provides various types of administrative, operational, configuration privilege levels. Eaton recommends that the available access control mechanisms be used properly to ensure that access to the system is restricted to legitimate users only. And, such users are restricted to only the privilege levels necessary to complete their job roles/functions. Eaton recommends below best practices to be followed to ensure adequate cybersecurity of the setup/system • Default credentials are changed upon first login. PowerXL Series VFD should not be commissioned for production with Default credentials, it's a serious Cybersecurity flaw as the default credentials are published in the manuals. Restrict administrative privileges - Threat actors are increasingly focused on gaining control of legitimate credentials, especially those associated with highly privileged accounts. Limit privileges to only those needed for a user's duties. Make sure that the password used in the device is only available to authorized users like Configuring Engineers and not shared among all operational users. • Perform periodic account maintenance to make sure that password is changed whenever there is personnel change. • Change passwords and other system access credentials as appropriate • PowerXL Series VFD is provided with data/access protection mechanism on keypad, follow below steps to utilize it PowerXL Series VFD provides four levels of data protection for users to ensure the security: 1. Lock parameters on keypad. User can lock the parameters through DI or disable change, in which way all the parameters cannot be edited. 2. Lock parameters while motor running. Motor control parameters can only be modified when motor is in stop mode. In which way to enhance the motor security. The parameters are listed in the application manual. 3. Through Power Xpert inControl tool, facility to hide parameters on keypad is available. User can hide the parameters he/she thinks are significant for himself/herself. Such as IP address and so on. 4. Password on keypad. ◦ 0000 means no password, which is the default. ◦ Password range is 0001 ~ 9999. ◦ With password, user can monitor parameters value but need enter password if he/she wants to edit parameters. ◦ User needs to re-enter the password if there is no key operation in 1 min after enter the password. ◦ User needs to enter the old password if he/she wants to change to a new one.
Restrict network access	PowerXL Series VFD provides network access to facilitate communication with other devices in the systems and configuration. But this capability could open up a big security hole if it's not configured securely. Eaton recommends segmentation of networks into logical enclaves and restrict the communication to host-to-host paths. This helps protect sensitive information and critical services and limits damage from network perimeter breaches. At a minimum, a utility Industrial Control Systems network should be segmented into a three-tiered architecture (as recommended by NIST SP800-82[R3]) for better security control. Deploy adequate network protection devices like Firewalls, Intrusion Detection / Protection devices. Below are the protocols and their port details available on PowerXL Series VFD. Use below information for configuring the firewalls. PowerXL Series VFD provides below communication protocols – • EtherNet IP protocols on RJ45 connector – enabled by default on port 44818 and 2222 • Modbus TCP protocol on RJ45 connector – enabled by default on port 502 • Modbus RTU on RS485 physical layer – enabled by default • BACnet MS/TP on RS485 physical layer – disabled by default, when this is enabled, Modbus RTU is disabled. All the protocols have dedicated menu structure, and details are described in User's Manual for how to activate or configure them. • Eaton has published detailed information about various Network level protection strategies in Eaton Cybersecurity Considerations for Electrical Distribution Systems [R1].

Table 210. PowerXL—secure configuration guidelines, continued

Category	Description
Logging and event management	**Best practices** • PowerXL Series VFD provides parameters change log and fault log functions for user, to help diagnose the drive 1. Parameters change log: • PowerXL Series VFD will log the parameter information in FRAM when the parameter changes. The max number of 66 items can be logged. New log will rewrite the old one. User cannot clear this fault information. 2. Fault log: • PowerXL Series VFD will log the drive information in FRAM when fault occurs. The max number of 10 items can be logged. New log will rewrite the old one. User can clear the history fault by pressing OK key more than 5 Sec. • PowerXL Series VFD will log the fault information in FRAM when fault occurs. The max number of 50 items can be logged. New log will rewrite the old one. User cannot clear this fault information.
Secure maintenance	**Best practices** **Apply Firmware updates and patches regularly** Due to rapidly increasing Cyber Threats in Industrial Control Systems, Eaton implements a comprehensive patch and update process for its products. Users are encouraged to maintain a consistent process to promptly monitor for fresh firmware updates and apply the update whenever required. • The latest firmware can be acquired from the www.eaton.com/drives website. There will be separate link for PowerXL Series VFD FR0 to FR6 and PowerXL Series VFD FR7 & FR8 • Users can also sign up on our website to get emails when new material is released to the site if desired. • Using the PC Tool or verifying on the keypad the current version of firmware can be verified. • For additional information or technical support on Eaton's Variable frequency drive products contact us at TRCDrives@eaton.com or by phone at 800-386-2273 for US customers. For European customers contact us at AfterSalesEGBonn@eaton.com or by phone at +49 (0) 228602-3640 Eaton also has a robust vulnerability response process. In the event of any security vulnerability getting discovered in its products, Eaton patches the vulnerability and releases information bulletin through its cybersecurity website - http://www.eaton.com/cybersecurity and patches through www.eaton.com/drives.

References

[R1] Cybersecurity Considerations for Electrical Distribution Systems (WP152002EN):

http://www.eaton.com/ecm/groups/public/@pub/@eaton/@corp/documents/content/pct_1603172.pdf

[R2] Cybersecurity Best Practices Checklist Reminder (WP910003EN):

http://www.cooperindustries.com/content/dam/public/powersystems/resources/library/1100_EAS/WP910003EN.pdf

We make what matters work.*

* At Eaton, we believe that power is a fundamental part of just about everything people do. Technology, transportation, energy and infrastructure—these are things the world relies on every day. That's why Eaton is dedicated to helping our customers find new ways to manage electrical, hydraulic and mechanical power more efficiently, safely and sustainably. To improve people's lives, the communities where we live and work, and the planet our future generations depend upon. Because that's what really matters. And we're here to make sure it works.

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