

Group I Ex d Motors for Underground Mining | TECO

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Technical Articles

Group I Certification and 1000V Availability: Specifying the TECO MAX Ex d for Underground Mining Applications

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HAZARDOUS AREA MOTORS

Underground mining places demands on electric motor specifications that surface installations don't face. Methane-present atmospheres in coal operations, high mineral dust concentrations, continuous duty cycles, limited access for maintenance, and increasing usage of 1000V distribution systems create a highly specialised environment. In this context, factors such as the Ex d rating, insulation class, and voltage capability become critical to safe and reliable operation.

The TECO MAX Ex d range is designed to address these requirements, offering Group I certification. Class F insulation combined with low temperature rise, and availability up to 1000V. TECO's ModShop capability in Australia and New Zealand allows non-standard configurations to be handled without returning to the factory. This significantly helps reduce lead times when a replacement motor is needed in an operational underground mine.

Atheer Yaseen Nashi, Product Manager for Low Voltage Motors across Australia and New Zealand, discusses the technical specifications and application considerations in more detail.

Q: What does Group I certification mean for the TECO MAX Ex d, and what does the full certification scope cover?

A: Group I refers to equipment intended for use in underground mines and their surface installations where the risk of firedamp, which is primarily methane, or coal dust is present. It is distinct from Group II, which covers above-ground surface installations.

The MAX Ex d carries two certifications within Group I: Ex db I Mb and Ex db IIB T4 Gb.

The Ex db designation is the flameproof protection concept, meaning that the motor enclosure is designed to contain any internal ignition and prevent flame propagation to the surrounding atmosphere.

The I Mb classification is specifically for underground methane-risk environments. The IIB T4 Gb certification extends this scope to surface hazardous area installations classified under Group II with temperature class T4, meaning the motor's external surface temperature does not exceed 135°C under

fault or overload conditions.

Having both within one product certification broadens the range of installations the motor can be specified for without requiring a separate product selection.

Q: The TECO MAX Ex d is stocked at 415V but available to order up to 1000V. What drives the 1000V requirement in underground mining, and what does that availability mean practically?

A: Underground mines have progressively moved to higher distribution voltages to reduce current levels and, in turn, minimise cable cross-section requirements at depth. At 1000V, the current for a given motor power is roughly 40% of the current at 415V.

In long underground installations where hundreds of metres of cabling run from the substation to the working face or pump station, this reduction in current directly decreases voltage drop and copper losses in the cable, allowing lighter cabling to be used for the same power delivery. The practical implication of 1000V availability is that the motor can be specified to match the mine's distribution voltage without requiring a step-down transformer at each installation point.

We stock the standard range at 415V for off-the-shelf availability, while 1000V variants are available to order. For mining operations planning new installations or major refurbishments on a 1000V system, the 1000V TECO MAX Ex d integrates directly into the distribution architecture without an intermediate transformer, helping reduce overall system cost.

Q: What is the significance of Class F insulation with low temperature rise for continuous underground operation?

A: Class F insulation is rated to 155°C. What matters in an underground context is not only the insulation class limit, but the motor's actual operating temperature rise relative to that limit.

The TECO MAX Ex d is designed with a low temperature rise, meaning the winding temperature under full-load, continuous S1 duty remains well below the Class F thermal limit. This thermal reserve has two practical benefits.

First, it offers headroom for elevated ambient temperatures in underground installations, which can be significant in deep mines or in areas close to diesel-powered equipment. Second, lower operating temperatures extend the life of the winding insulation over the motor's service life.

The relationship between temperature and insulation degradation is well established: operating consistently below the insulation class limit can significantly extend service life compared with running close to it. In continuous-duty underground applications, where access for replacement is limited and downtime carries a high operational cost, this thermal margin is a valuable specification consideration.

Q: What modifications does the local TECO ModShop handle, and why does local accredited modification matter for underground operations?

A: The TECO ModShop facilities in Australia and New Zealand are accredited to carry out modifications to Ex d motors while maintaining the certification integrity of the product. The modifications that can be handled locally cover the practical range of non-standard requirements that arise in underground motor replacement, including terminal box orientation changes to match existing cable entry positions, cable entry configuration changes such as gland plate and conduit entry arrangements, anti-condensation

heater installation, as well as shaft and mounting adjustments.

These are the modifications that most frequently make a standard catalogue motor unsuitable for a specific underground installation. The alternative to local modification is returning the motor to the factory, which typically adds weeks rather than days to lead times.

In an underground operation where a critical pump or conveyor motor has failed, that lead time difference is far from minor. Accreditation is important because modifying an Ex d motor outside an approved facility can void its certification, meaning the motor cannot legally be redeployed in a classified hazardous area .

The TECO ModShop ensures modifications within the certification framework, so the motor remains compliant once the work has been completed.

Q: What are the most common underground applications for the TECO MAX Ex d across the power range available off the shelf?

A: The off-the-shelf range covers 0.75kW to 110kW at 415V in heavy-duty cast-iron frames . In a typical underground mine, applications within this range include conveyor drives, often the highest installed motor count in an underground operation, along with underground pump motors for dewatering and process water systems , ventilation auxiliary fans , and ancillary drives on mining machinery.

The 0.75kW to 110kW range covers most of these applications at standard underground distribution voltages. Cast iron frames are appropriate for underground environments, as the material is highly resistant to mechanical impact, maintains structural integrity through repeated thermal cycling, and avoids galvanic compatibility issues that can occur with aluminium enclosures in wet underground conditions. Motors above 110kW in the Ex d range are available to order from the factory.

Q: When replacing an underground motor in a live operation, what are the key specification checks before committing to a replacement?

A: The certification scope is the first thing to check. The replacement motor must carry the appropriate certification appropriate to the zone classification of the installation.

For Group I methane-risk underground environments, this means confirming the I Mb certification is present. The voltage rating must also match the distribution system at the installation point, whether that is 415V or 1000V.

Frame dimensions and shaft specification need to match the driven equipment to avoid modifications to the coupling or mounting arrangement, which adds significant time during an unplanned replacement situation. The terminal box orientation and cable entry configuration also need to align with the existing conduit or cable tray arrangement. This is where the TECO Modshop becomes particularly valuable if the standard orientation is not compatible.

The duty cycle and load profile should be checked against the motor nameplate power to ensure the replacement is not undersized for the application. If the existing installation includes an anti-condensation heater circuit, this should also be confirmed as part of the replacement motor specification.

These are standard checks, but in an unplanned underground replacement, they are often the factors that cause delay when left until the replacement motor has already arrived on site.

Q: Is there a technical data sheet and certification scope document available, and what information do those documents include?

A: Yes. The TECO MAX Ex d technical data sheet covers the full dimensional data for each frame size, nameplate power ratings at 415V, and ordering information for 1000V variants. It also includes the certification numbers for Ex db I Mb and Ex db IIB T4 Gb, thermal data including temperature rise figures at rated load under continuous duty, as well as the standard and optional terminal box configurations.

The certification scope document details the specific conditions of use attached to the certification. This is the document that maintenance and engineering teams should keep on file for each motor installation in a classified area. The conditions of use define the permissible operating parameters, any restrictions relating to the installation environment, and inspection requirements needed to maintain certification validity.

TECO is happy to provide both documents for any specific frame size or voltage variant under consideration.

PRODUCT REFERENCE

Product	TECO MAX Ex d
Certification	Ex db I Mb (Group I underground) and Ex db IIB T4 Gb (Group II surface)
Stocked voltage	415V — Available off the shelf
Order voltage	Up to 1000V — Available to order
Insulation	Class F (155°C rated), with low temperature rise
Frames	TEFC Heavy-duty cast iron
Power range	0.75kW to 110kW off the shelf (larger sizes available to order)
TECO ModShop	Local accredited facility: terminal box, cable entry, heaters, shaft/mounting — No factory return required
Primary use	Underground conveyor drives, dewatering pumps, auxiliary fans, mine equipment drives
Company & Division	TECO Australia & New Zealand, Electric Motors Division

For technical specifications, certification documentation, and application support:

<https://electricmotors.teco.com.au/>

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