

Rexroth IndraDrive Fc Drive Controllers Frequency Converters FCS01

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Edition 01

Operating Instructions



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Purpose of Documentation	This documentation provides information on the installation and operation of the described products by persons trained and qualified to work with electrical installations.
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D Deutsch	USA English	F Français
⚠ WARNING Lebensgefahr bei Nichtbeachtung der nachstehenden Sicherheitshinweise! Nehmen Sie die Produkte erst dann in Betrieb, nachdem Sie die mit dem Produkt gelieferten Unterlagen und Sicherheitshinweise vollständig durchgelesen, verstanden und beachtet haben. Sollten Ihnen keine Unterlagen in Ihrer Landessprache vorliegen, wenden Sie sich an Ihren zuständigen Rexroth-Vertriebspartner. Nur qualifiziertes Personal darf an Antriebskomponenten arbeiten. Nähere Erläuterungen zu den Sicherheitshinweisen entnehmen Sie Kapitel 1 dieser Dokumentation.	⚠ WARNING Danger to life in case of non-compliance with the below-mentioned safety instructions! Do not attempt to install or put these products into operation until you have completely read, understood and observed the documents supplied with the product. If no documents in your language were supplied, please consult your Rexroth sales partner. Only qualified persons may work with drive components. For detailed explanations on the safety instructions, see chapter 1 of this documentation.	⚠ AVERTISSEMENT Danger de mort en cas de non-respect des consignes de sécurité figurant ci-après ! Ne mettez les produits en service qu'après avoir lu complètement et après avoir compris et respecté les documents et les consignes de sécurité fournis avec le produit. Si vous ne disposez pas de la documentation dans votre langue, merci de consulter votre partenaire Rexroth. Seul un personnel qualifié est autorisé à travailler sur les composants d'entraînement. Vous trouverez des explications plus détaillées relatives aux consignes de sécurité au chapitre 1 de la présente documentation.
⚠ WARNING Hohe elektrische Spannung! Lebensgefahr durch elektrischen Schlag! Betreiben Sie Antriebskomponenten nur mit fest installiertem Schutzleiter. Schalten Sie vor Zugriff auf Antriebskomponenten die Spannungsversorgung aus. Beachten Sie die Entladezeiten von Kondensatoren.	⚠ WARNING High electrical voltage! Danger to life by electric shock! Only operate drive components with a permanently installed equipment grounding conductor. Disconnect the power supply before accessing drive components. Observe the discharge times of the capacitors.	⚠ AVERTISSEMENT Tensions électriques élevées ! Danger de mort par électrocution ! N'exploitez les composants d'entraînement que si un conducteur de protection est installé de manière permanente. Avant d'intervenir sur les composants d'entraînement, coupez toujours la tension d'alimentation. Tenez compte des délais de décharge de condensateurs.
⚠ WARNING Gefahrbringende Bewegungen! Lebensgefahr! Halten Sie sich nicht im Bewegungsbereich von Maschinen und Maschinenteilen auf. Verhindern Sie den unbeabsichtigten Zutritt für Personen. Bringen Sie vor dem Zugriff oder Zutritt in den Gefahrenbereich die Antriebe sicher zum Stillstand.	⚠ WARNING Dangerous movements! Danger to life! Keep free and clear of the ranges of motion of machines and moving machine parts. Prevent personnel from accidentally entering the range of motion of machines. Make sure that the drives are brought to safe standstill before accessing or entering the danger zone.	⚠ AVERTISSEMENT Mouvements entraînant une situation dangereuse ! Danger de mort ! Ne séjournez pas dans la zone de mouvement de machines et de composants de machines. Évitez tout accès accidentel de personnes. Avant toute intervention ou tout accès dans la zone de danger, assurez-vous de l'arrêt préalable de tous les entraînements.
⚠ WARNING Elektromagnetische / magnetische Felder! Gesundheitsgefahr für Personen mit Herzschrittmachern, metallischen Implantaten oder Hörgeräten! Zutritt zu Bereichen, in denen Antriebskomponenten montiert und betrieben werden, ist für oben genannten Personen untersagt bzw. nur nach Rücksprache mit einem Arzt erlaubt.	⚠ WARNING Electromagnetic / magnetic fields! Health hazard for persons with heart pacemakers, metal implants or hearing aids! The above-mentioned persons are not allowed to enter areas in which drive components are mounted and operated, or rather are only allowed to do this after they consulted a doctor.	⚠ AVERTISSEMENT Champs électromagnétiques / magnétiques ! Risque pour la santé des porteurs de stimulateurs cardiaques, d'implants métalliques et d'appareils auditifs ! L'accès aux zones où sont montés et exploités les composants d'entraînement est interdit aux personnes susmentionnées ou bien ne leur est autorisé qu'après consultation d'un médecin.
⚠ VORSICHT Heiße Oberflächen (> 60 °C)! Verbrennungsgefahr! Vermeiden Sie das Berühren von metallischen Oberflächen (z. B. Kühlkörpern). Abkühlzeit der Antriebskomponenten einhalten (mind. 15 Minuten).	⚠ CAUTION Hot surfaces (> 60 °C [140 °F])! Risk of burns! Do not touch metallic surfaces (e.g. heat sinks). Comply with the time required for the drive components to cool down (at least 15 minutes).	⚠ ATTENTION Surfaces chaudes (> 60 °C)! Risque de brûlure ! Évitez de toucher des surfaces métalliques (p. ex. dissipateurs thermiques). Respectez le délai de refroidissement des composants d'entraînement (au moins 15 minutes).

D Deutsch	USA English	F Français
⚠ VORSICHT Unsachgemäße Handhabung bei Transport und Montage! Verletzungsgefahr! Verwenden Sie geeignete Montage- und Transporteinrichtungen. Benutzen Sie geeignetes Werkzeug und persönliche Schutzausrüstung.	⚠ CAUTION Improper handling during transport and mounting! Risk of injury! Use suitable equipment for mounting and transport. Use suitable tools and personal protective equipment.	⚠ ATTENTION Manipulation incorrecte lors du transport et du montage ! Risque de blessure ! Utilisez des dispositifs de montage et de transport adéquats. Utilisez des outils appropriés et votre équipement de protection personnel.
⚠ VORSICHT Unsachgemäße Handhabung von Batterien! Verletzungsgefahr! Versuchen Sie nicht, leere Batterien zu reaktivieren oder aufzuladen (Explosions- und Verätzungsgefahr). Zerlegen oder beschädigen Sie keine Batterien. Werfen Sie Batterien nicht ins Feuer.	⚠ CAUTION Improper handling of batteries! Risk of injury! Do not attempt to reactivate or recharge low batteries (risk of explosion and chemical burns). Do not dismantle or damage batteries. Do not throw batteries into open flames.	⚠ ATTENTION Manipulation incorrecte de piles! Risque de blessure! N'essayez pas de réactiver des piles vides ou de les charger (risque d'explosion et de brûlure par acide). Ne désassemblez et n'endommagez pas les piles. Ne jetez pas des piles dans le feu.

E Español	P Português	I Italiano
⚠ ADVERTENCIA ¡Peligro de muerte en caso de no observar las siguientes indicaciones de seguridad! Los productos no se pueden poner en servicio hasta después de haber leído por completo, comprendido y tenido en cuenta la documentación y las advertencias de seguridad que se incluyen en la entrega. Si no dispusiera de documentación en el idioma de su país, diríjase a su distribuidor competente de Rexroth. Solo el personal debidamente cualificado puede trabajar en componentes de accionamiento. Encontrará más detalles sobre las indicaciones de seguridad en el capítulo 1 de esta documentación.	⚠ ATENÇÃO Perigo de vida em caso de inobservância das seguintes instruções de segurança! Utilize apenas os produtos depois de ter lido, compreendido e tomado em consideração a documentação e as instruções de segurança fornecidas juntamente com o produto. Se não tiver disponível a documentação na sua língua, dirija-se ao seu parceiro de venda responsável da Rexroth. Apenas pessoal qualificado pode trabalhar nos componentes de acionamento. Explicações mais detalhadas relativamente às instruções de segurança constam no capítulo 1 desta documentação.	⚠ AVVERTENZA Pericolo di morte in caso di inosservanza delle seguenti indicazioni di sicurezza! Mettere in funzione i prodotti solo dopo aver letto, compreso e osservato per intero la documentazione e le indicazioni di sicurezza fornite con il prodotto. Se non dovesse essere presente la documentazione nella vostra lingua, siete pregati di rivolgervi al rivenditore Rexroth competente. Solo personale qualificato può eseguire lavori sui componenti di comando. Per ulteriori spiegazioni riguardanti le indicazioni di sicurezza consultare il capitolo 1 di questa documentazione.
⚠ ADVERTENCIA ¡Alta tensión eléctrica! ¡Peligro de muerte por descarga eléctrica! Active sólo los componentes de accionamiento con el conductor protector firmemente instalado. Desconecte la alimentación eléctrica antes de manipular los componentes de accionamiento. Tenga en cuenta los tiempos de descarga de los condensadores.	⚠ ATENÇÃO Alta tensão elétrica! Perigo de vida devido a choque elétrico! Opere componentes de acionamento apenas com condutores de proteção instalados. Desligue a alimentação de tensão antes de aceder aos componentes de acionamento. Respeite os períodos de descarga dos condensadores.	⚠ AVVERTENZA Alta tensione elettrica! Pericolo di morte in seguito a scosse elettriche! Mettere in esercizio i componenti di comando solo con conduttore di messa a terra ben installato. Staccare l'alimentazione prima di intervenire sui componenti di comando. Osservare i tempi di scarica del condensatore.
⚠ ADVERTENCIA ¡Movimientos peligrosos! ¡Peligro de muerte! No permanezca en la zona de movimiento de las máquinas ni de sus piezas. Impida el acceso accidental de personas. Antes de acceder o introducir las manos en la zona de peligro, los accionamientos se tienen que haber parado con seguridad.	⚠ ATENÇÃO Movimentos perigosos! Perigo de vida! Não permaneça na área de movimentação das máquinas e das peças das máquinas. Evite o acesso involuntário para pessoas. Antes de entrar ou aceder à área perigosa, imobilize os acionamentos de forma segura.	⚠ AVVERTENZA Movimenti pericolosi! Pericolo di morte! Non sostare nelle zone di manovra delle macchine e delle loro parti. Impedire un accesso non autorizzato per le persone. Prima di accedere alla zona di pericolo, arrestare e bloccare gli azionamenti.

E Español	P Português	I Italiano
⚠ ADVERTENCIA ¡Campos electromagnéticos/magnéticos! ¡Peligro para la salud de las personas con marcapasos, implantes metálicos o audífonos! El acceso de las personas arriba mencionadas a las zonas de montaje o funcionamiento de los componentes de accionamiento está prohibido, salvo que lo autorice previamente un médico.	⚠ ATENÇÃO Campos eletromagnéticos / magnéticos! Perigo de saúde para pessoas com marcapassos, implantes metálicos ou aparelhos auditivos! Acesso às áreas, nas quais os componentes de acionamento são montados e operados, é proibido para as pessoas em cima mencionadas ou apenas após permissão de um médico.	⚠ AVVERTENZA Campi elettromagnetici / magnetici! Pericolo per la salute delle persone portatrici di pacemaker, protesi metalliche o apparecchi acustici! L'accesso alle zone in cui sono installati o in funzione componenti di comando è vietato per le persone sopra citate o consentito solo dopo un colloquio con il medico.
⚠ ATENCIÓN ¡Superficies calientes (> 60 °C)! ¡Peligro de quemaduras! Evite el contacto con las superficies calientes (p. ej., disipadores de calor). Observe el tiempo de enfriamiento de los componentes de accionamiento (mín. 15 minutos).	⚠ CUIDADO Superfícies quentes (> 60 °C)! Perigo de queimaduras! Evite tocar superfícies metálicas (p. ex. radiadores). Respeite o tempo de arrefecimento dos componentes de acionamento (mín. 15 minutos).	⚠ ATTENZIONE Superfici bollenti (> 60 °C)! Pericolo di ustioni! Evitare il contatto con superfici metalliche (ad es. dissipatori di calore). Rispettare i tempi di raffreddamento dei componenti di comando (almeno 15 minuti).
⚠ ATENCIÓN ¡Manipulación inadecuada en el transporte y montaje! ¡Peligro de lesiones! Utilice dispositivos de montaje y de transporte adecuados. Utilice herramientas adecuadas y equipo de protección personal.	⚠ CUIDADO Manejo incorreto no transporte e montagem! Perigo de ferimentos! Utilize dispositivos de montagem e de transporte adequados. Utilize ferramentas e equipamento de proteção individual adequados.	⚠ ATTENZIONE Manipolazione inappropriata durante il trasporto e il montaggio! Pericolo di lesioni! Utilizzare dispositivi di montaggio e trasporto adatti. Utilizzare attrezzi adatti ed equipaggiamento di protezione personale.
⚠ ATENCIÓN ¡Manejo inadecuado de las pilas! ¡Peligro de lesiones! No trate de reactivar o cargar pilas descargadas (peligro de explosión y cauterización). No desarme ni dañe las pilas. No tire las pilas al fuego.	⚠ CUIDADO Manejo incorreto de baterias! Perigo de ferimentos! Não tente reativar nem carregar baterias vazias (perigo de explosão e de queimaduras com ácido). Não desmonte nem danifique as baterias. Não deite as baterias no fogo.	⚠ ATTENZIONE Utilizzo inappropriato delle batterie! Pericolo di lesioni! Non tentare di riattivare o ricaricare batterie scariche (pericolo di esplosione e corrosione). Non scomporre o danneggiare le batterie. Non gettare le batterie nel fuoco.

S Svenska	DK Dansk	NL Nederlands
⚠ VARNING Livsfara om följande säkerhetsanvisningar inte följs! Använd inte produkterna innan du har läst och förstått den dokumentation och de säkerhetsanvisningar som medföljer produkten, och följ alla anvisningar. Kontakta din Rexroth-återförsäljare om dokumentationen inte medföljer på ditt språk. Endast kvalificerad personal får arbeta med drivkomponenterna. Se kapitel 1 i denna dokumentation för närmare beskrivningar av säkerhetsanvisningarna.	⚠ ADVARSEL Livsfare ved manglende overholdelse af nedenstående sikkerhedsanvisninger! Tag ikke produktet i brug, før du har læst og forstået den dokumentation og de sikkerhedsanvisninger, som følger med produktet, og overhold de givne anvisninger. Kontakt din Rexroth-forhandler, hvis dokumentationen ikke medfølger på dit sprog. Det er kun kvalificeret personale, der må arbejde på drive components. Nærmere forklaringer til sikkerhedsanvisningerne fremgår af kapitel 1 i denne dokumentation.	⚠ WAARSCHUWING Levensgevaar bij niet-naleving van onderstaande veiligheidsinstructies! Stel de producten pas in bedrijf nadat u de met het product geleverde documenten en de veiligheidsinformatie volledig gelezen, begrepen en in acht genomen heeft. Mocht u niet beschikken over documenten in uw landstaal, kunt u contact opnemen met uw plaatselijke Rexroth distributiepartner. Uitsluitend gekwalificeerd personeel mag aan de aandrijvingscomponenten werken. Meer informatie over de veiligheidsinstructies vindt u in hoofdstuk 1 van deze documentatie.
⚠ VARNING Hög elektrisk spänning! Livsfara genom elchock! Använd endast drivkomponenterna med fastmonterad skyddsledare. Koppla bort spänningsförsörjningen före arbete på drivkomponenter. Var medveten om kondensatorernas urladdningstid.	⚠ ADVARSEL Elektrisk højspænding! Livsfare på grund af elektrisk stød! Drive components må kun benyttes med et fast installeret jordstik. Sørg for at koble spændingsforsyningen fra, inden du rører ved drive components. Overhold kondensatorernes afladningstider.	⚠ WAARSCHUWING Hoge elektrische spanning! Levensgevaar door elektrische schok! Bedien de aandrijvingscomponenten uitsluitend met vast geïnstalleerde aardleiding. Schakel voor toegang tot aandrijvingscomponenten de spanningsvoorziening uit. Neem de ontladtijden van condensatoren in acht.

S Svenska	DK Dansk	NL Nederlands
⚠️ VARNING Farliga rörelser! Livsfara! Uppehåll dig inte inom maskiners och maskindelarars rörelseområde. Förhindra att obehöriga personer får tillträde. Innan du börjar arbeta eller vistas inom drivsystemets riskområde måste maskinen vara stillastående.	⚠️ ADVARSEL Farlige bevægelser! Livsfare! Du må ikke opholde dig inden for maskiners og maskindeles bevægelsesradius. Sørg for, at ingen personer kan få utilsigtet adgang. Standt drevene helt, inden du rører ved drevene eller træder ind i deres fareområde.	⚠️ WAARSCHUWING Risicovolle bewegingen! Levensgevaar! Houdt u niet op in het bewegingsbereik van machines en machineonderdelen. Voorkom dat personen onbedoeld toegang verkrijgen. Voor toegang tot de gevaarlijke zone moeten de aandrijvingen veilig tot stilstand gebracht zijn.
⚠️ VARNING Elektromagnetiska/magnetiska fält! Hälsofara för personer med pacemaker, implantat av metall eller hörapparat! Det är förbjudet för ovan nämnda personer (eller kräver överläggning med läkare) att beträda områden där drivkomponenter är monterade och i drift.	⚠️ ADVARSEL Elektromagnetiske/magnetiske felter! Sundhedsfare for personer med pacemakere, metalliske implantater eller høreapparater! For disse personer er der adgang forbudt eller kun adgang med tilladelse fra læge til de områder, hvor drive components monteres og drives.	⚠️ WAARSCHUWING Elektromagnetische / magnetische velden! Gevaar voor de gezondheid van personen met pacemakers, metalen implantaten of hoorapparaten! Toegang tot gebieden, waarin aandrijvingscomponenten worden gemonteerd en bediend, is verboden voor voornoemde personen of uitsluitend toegestaan na overleg met een arts.
⚠️ OBSERVERA Varma ytor (> 60 °C)! Risk för brännskador! Undvik att vidröra metallytor (t.ex. kylelement). Var medveten om att det tar tid för drivkomponenterna att svalna (minst 15 minuter).	⚠️ FORSIGTIG Varme overflader (> 60 °C)! Risiko for forbrændinger! Undgå at berøre metaloverflader (f.eks. kølelementer). Overhold drive components nedkølingstid (min. 15 min.).	⚠️ VOORZICHTIG Hete oppervlakken (> 60 °C)! Verbrandingsgevaar! Voorkom contact met metalen oppervlakken (bijv. Koellichamen). Afkoeltijd van de aandrijvingscomponenten in acht nemen (min. 15 minuten).
⚠️ OBSERVERA Felaktig hantering vid transport och montering! Skaderisk! Använd passande monterings- och transportanordningar. Använd lämpliga verktyg och personlig skyddsutrustning.	⚠️ FORSIGTIG Fejlhåndtering ved transport og montering! Risiko for kvæstelser! Benyt egnede monterings- og transportanordninger. Benyt egnet værktøj og personligt sikkerhedsudstyr.	⚠️ VOORZICHTIG Onjuist gebruik bij transport en montage! Letselgevaar! Gebruik geschikte montage- en transportinrichtingen. Gebruik geschikt gereedschap en een persoonlijke veiligheidsuitrusting.
⚠️ OBSERVERA Felaktig hantering av batterier! Skaderisk! Försök inte återaktivera eller ladda upp batterier (risk för explosioner och frätskador). Batterierna får inte tas isär eller skadas. Släng inte batterierna i elden.	⚠️ FORSIGTIG Fejlhåndtering af batterier! Risiko for kvæstelser! Forsøg ikke at genaktivere eller oplade tomme batterier (eksplosions- og ætsningsfare). Undlad at skille batterier ad eller at beskadige dem. Smid ikke batterier ind i åben ild.	⚠️ VOORZICHTIG Onjuist gebruik van batterijen! Letselgevaar! Probeer nooit lege batterijen te reactiveren of op te laden (explosiegevaar en gevaar voor beschadiging van weefsel door cauterisatie). Batterijen niet demonteren of beschadigen. Nooit batterijen in het vuur werpen.

FIN Suomi	PL Polski	CZ Český
VAROITUS Näiden turvaohjeiden noudattamatta jättämisestä on seurauksena hengenvaara! Ota tuote käyttöön vasta sen jälkeen, kun olet lukenut läpi tuotteen mukana toimitetut asiakirjat ja turvallisuusohjeet, ymmärtänyt ne ja ottanut ne huomioon. Jos asiakirjoja ei ole saatavana omalla äidinkielelläsi, ota yhteys asianomaiseen Rexrothin myyntiedustajaan. Käyttölaitteiden komponenttien parissa saa työskennellä ainoastaan valtuutettu henkilöstö. Lisätietoa turvaohjeista löydät tämän dokumentaation luvusta 1.	OSTRZEŻENIE Zagrożenie życia w razie nieprzestrzegania poniższych wskazówek bezpieczeństwa! Nie uruchamiać produktów przed uprzednim przeczytaniem i pełnym zrozumieniem wszystkich dokumentów dostarczonych wraz z produktem oraz wskazówek bezpieczeństwa. Należy przestrzegać wszystkich zawartych tam zaleceń. W przypadku braku dokumentów w Państwa języku, prosimy o skontaktowanie się z lokalnym partnerem handlowym Rexroth. Przy zespołach napędowych może pracować wyłącznie wykwalifikowany personel. Blizsze objaśnienia wskazówek bezpieczeństwa znajdują się w Rozdziale 1 niniejszej dokumentacji.	VAROVÁNÍ Nebezpečí života v případě nedodržení níže uvedených bezpečnostních pokynů! Před uvedením výrobků do provozu si přečtěte kompletní dokumentaci a bezpečnostní pokyny dodávané s výrobkem, pochopte je a dodržujte. Nemáte-li k dispozici podklady ve svém jazyce, obraťte se na příslušného obchodního partnera Rexroth. Na komponentách pohonu smí pracovat pouze kvalifikovaný personál. Podrobnější vysvětlení k bezpečnostním pokynům naleznete v kapitole 1 této dokumentace.
VAROITUS Voimakas sähköjännite! Sähköiskun aiheuttama hengenvaara! Käytä käyttölaitteen komponentteja ainoastaan maadoitusjohtimen ollessa kiinteästi asennettuna. Katkaise jännitteensyöttö ennen käyttölaitteen komponenteille suoritettavien töiden aloittamista. Huomioi kondensaattoreiden purkausajat.	OSTRZEŻENIE Wysokie napięcie elektryczne! Zagrożenie życia w wyniku porażenia prądem! Zespoły napędu mogą być eksploatowane wyłącznie z zainstalowanym na stałe przewodem ochronnym. Przed uzyskaniem dostępu do podzespołów napędu należy odłączyć zasilanie elektryczne. Zwracać uwagę na czas rozładowania kondensatorów.	VAROVÁNÍ Vysoké elektrické napětí! Nebezpečí života při zasažení elektrickým proudem! Komponenty pohonu smí být v provozu pouze s pevně nainstalovaným ochranným vodičem. Než začnete zasahovat do komponent pohonu, odpojte je od elektrického napájení. Dodržujte vybíjecí časy kondenzátorů.
VAROITUS Vaarallisia liikkeitä! Hengenvaara! Älä oleskele koneiden tai koneenosien liikealueella. Pidä huolta siitä, ettei muita henkilöitä pääse alueelle vahingossa. Pysäytä käyttölaitteet varmasti ennen vaara-alueelle koskemista tai menemistä.	OSTRZEŻENIE Niebezpieczne ruchy! Zagrożenie życia! Nie wolno przebywać w obszarze pracy maszyny i jej elementów. Nie dopuszczać osób niepowołanych do obszaru pracy maszyny. Przed dotknięciem urządzenia/maszyny lub zbliżeniem się do obszaru zagrożenia należy zgodnie z zasadami bezpieczeństwa wyłączyć napędy.	VAROVÁNÍ Nebezpečné pohyby! Nebezpečí života! Nezdržujte se v dosahu pohybu strojů a jejich součástí. Zabraňte náhodnému přístupu osob. Před zásahem nebo vstupem do nebezpečného prostoru bezpečně zastavte pohony.
VAROITUS Sähkömagneettisia/ magneettisia kenttiä! Terveystieteiden haavojen vaara henkilölle, joilla on sydämentahdistin, metallinen implantti tai kuulolaite! Yllä mainituilta henkilöiltä on pääsy kielletty alueelle, joilla asennetaan tai käytetään käyttölaitteen komponentteja, tai heidän on ensin saatava tähän suostumus lääkäriltään.	OSTRZEŻENIE Pola elektromagnetyczne / magnetyczne! Zagrożenie zdrowia dla osób z rozrusznikiem serca, metalowymi implantami lub aparatami słuchowymi! Wstęp na teren, gdzie odbywa się montaż i eksploatacja napędów jest dla ww. osób zabroniony względnie dozwolony po konsultacji z lekarzem.	VAROVÁNÍ Elektromagnetická/ magnetická pole! Nebezpečí pro zdraví osob s kardiostimulátory, kovovými implantáty nebo naslouchadly! Výše uvedené osoby mají zakázán přístup do prostorů, kde jsou montovány a používány komponenty pohonu, resp. ho mají povolen pouze po poradě s lékařem.
HUOMIO Kuumia pintoja (> 60 °C)! Palovammojen vaara! Vältä metallipintojen koskettamista (esim. jäähdytyslevyt). Noudata käyttölaitteen komponenttien jäähdytysaikoja (väh. 15 minuuttia).	PRZESTROGA Gorące powierzchnie (> 60 °C)! Niebezpieczeństwo poparzenia! Unikać kontaktu z powierzchniami metalowymi (np. radiatorami). Przestrzegać czasów schładzania podzespołów napędów (min. 15 minut).	UPOZORNĚNÍ Horké povrchy (> 60 °C)! Nebezpečí popálení! Nedotýkejte se kovových povrchů (např. chladičů těles). Dodržujte dobu ochlazení komponent pohonu (min. 15 minut).

FIN Suomi	PL Polski	CZ Český
▲HUOMIO Epäasianmukainen käsittely kuljetuksen ja asennuksen yhteydessä! Loukkaantumisvaara! Käytä soveltuvia asennus- ja kuljetuslaitteita. Käytä omia työkaluja ja henkilökohtaisia suojavarusteita.	▲PRZESTROGA Niewłaściwe obchodzenie się podczas transportu i montażu! Ryzyko urazu! Stosować odpowiednie urządzenia montażowe i transportowe. Stosować odpowiednie narzędzia i środki ochrony osobistej.	▲UPOZORNĚNÍ Nesprávné zacházení při přepravě a montáži! Nebezpečí zranění! Používejte vhodná montážní a dopravní zařízení. Používejte vhodné nářadí a osobní ochranné vybavení.
▲HUOMIO Pariston epäasianmukainen käsittely! Loukkaantumisvaara! Älä yritä saada tyhjiä paristoja toimimaan tai ladata niitä uudelleen (räjähdys- ja syöpymisvaara). Älä hajota paristoja osiin tai vaurioita niitä. Älä heitä paristoja tulleen.	▲PRZESTROGA Niewłaściwe obchodzenie się z bateriami! Ryzyko urazu! Nie próbować reaktywować i nie ładować zużytych baterii (niebezpieczeństwo wybuchu oraz poparzenia żrącą substancją). Nie demontować i nie niszczyć baterii. Nie wrzucać baterii do ognia.	▲UPOZORNĚNÍ Nesprávné zacházení s bateriemi! Nebezpečí zranění! Nepokoušejte se znovu aktivovat nebo dobíjet prázdné baterie (nebezpečí výbuchu a poleptání). Nerozebírejte ani nepoškozujte baterie. Neházejte baterie do ohně.

SLO Slovensko	SK Slovenčina	RO Română
▲OPOZORILO Življenjska nevarnost pri neupoštevanju naslednjih napotkov za varnost! Izdelke začnite uporabljati šele, ko v celoti preberete, razumete in upoštevate izdelkom priloženo dokumentacijo in varnostne napotke. Če priložena dokumentacija ni na voljo v vašem maternem jeziku, se obrnite na pristojnega distributerja Rexroth. Samo kvalificirano osebje sme delati na pogonskih komponentah. Podrobnejša pojasnila o varnostnih navodilih najdete v poglavju 1 v tej dokumentaciji.	▲VAROVANIE Nebezpečnostv ohrozenia života pri nedodržiavaní nasledujúcich bezpečnostných pokynov! Výrobky uvádzajte do prevádzky až potom, čo ste úplne prečítali, pochopili a zobrali do úvahy podklady a bezpečnostné pokyny dodané s výrobkom. Ak by ste nemali k dispozícii žiadne podklady v jazyku svojej krajiny, obráťte sa prosím na svojho príslušného predajcu Rexroth. Na komponentoch pohonu smie pracovať iba kvalifikovaný personál. Bližšie vysvetlenia k bezpečnostným pokynom zistíte z kapitoly 1 tejto dokumentácie.	▲AVERTIZARE Pericol de moarte în cazul nerespectării următoarelor instrucțiuni de siguranță! Punerea în funcțiune a produselor trebuie efectuată după citirea, înțelegerea și respectarea documentelor și instrucțiunilor de siguranță, care sunt livrate împreună cu produsele. În cazul în care documentele nu sunt în limba dumneavoastră maternă, vă rugăm să contactați partenerul de vânzări Rexroth. Numai un personal calificat poate lucra cu componentele de acționare. Explicații detaliate privind instrucțiunile de siguranță găsiți în capitolul 1 al acestei documentații.
▲OPOZORILO Visoka električna napetost! Življenjska nevarnost zaradi električnega udara! Pogonske komponente uporabljajte samo s fiksno nameščenim zaščitnim vodnikom. Pred dostopom do pogonske komponente odklopite napajanje. Upoštevajte čase praznjenja kondenzatorjev.	▲VAROVANIE Vysoké elektrické napätie! Nebezpečnostv ohrozenia života v dôsledku zásahu elektrickým prúdom! Komponenty pohonu prevádzkujte iba s pevne nainštalovaným ochranným vodičom. Pred prístupom na komponenty pohonu odpojte zdroj napätia. Rešpektujte časy vybitia kondenzátorov.	▲AVERTIZARE Tensiune electrică înaltă! Pericol de moarte prin electrocutare! Exploatați componentele de acționare numai cu împământarea instalată permanent. Înainte de intervenția asupra componentelor de acționare, deconectați alimentarea cu tensiune electrică. Țineți cont de timpii de descărcare ai condensatorilor.
▲OPOZORILO Nevami premikil! Življenjska nevarnost! Ne zadržujte se v območju delovanja strojev. Preprečite nenadzorovan dostop oseb. Pred prijemom ali dostopom v nevarno območje varno zaustavite vse gnane dele.	▲VAROVANIE Pohyby prinášajúce nebezpečnostv! Nebezpečnostv ohrozenia života! Nezdržiaavajte sa v oblasti pohybu strojov a častí strojov. Zabráňte nepovolanému prístupu osôb. Pred zásahom alebo prístupom do nebezpečnej oblasti uveďte pohony bezpečne do zastavenia.	▲AVERTIZARE Mișcări periculoase! Pericol de moarte! Nu staționați în zona de mișcare a mașinilor și a componentelor în mișcare a mașinilor. Împiedicați accesul neintenționat al persoanelor în zona de lucru a mașinilor. Înainte de intervenția sau accesul în zona periculoasă, opriți în siguranță componentele de acționare.

SLO Slovensko	SK Slovenčina	RO Română
▲ OPOZORILO Elektromagnetna / magnetna polja! Nevarnost za zdravje za osebe s spodbujevalniki srca, kovinskimi vsadki ali slušnimi aparati! Dostop do območij, v katerih so nameščene delujoče pogonske komponente, je za zgoraj navedene osebe prepovedan oz. dovoljen samo po posvetu z zdravnikom.	▲ VAROVANIE Elektromagnetické/ magnetické polia! Nebezpečenstvo pre zdravie osôb s kardioštimulátormi, kovovými implantátmi alebo načúvacími prístrojmi! Prístup k oblastiam, v ktorých sú namontované a prevádzkujú sa komponenty pohonu, je pre hore uvedené osoby zakázaný resp. je dovolený iba po konzultácii s lekárom.	▲ AVERTIZARE Câmpuri electromagnetice / magnetice! Pericol pentru sănătatea persoanelor cu stimulatore cardiace, implanturi metalice sau aparate auditive! Intrarea în zone, în care se montează sau se exploatează componente de acționare, este interzisă pentru persoanele sus numite respectiv este permisă numai cu acordul medicului.
▲ POZOR Vroče površine (> 60 °C)! Nevarnost opeklin! Izogibajte se stiku s kovinskimi površinami (npr. hladilnimi telesii). Upošteвайте čas hlajenja pogonskih komponent (najm. 15 minut).	▲ UPOZORNENIE Horúce povrchy (> 60 °C)! Nebezpečenstvo popálenia! Zabráňte kontaktu s kovovými povrchmi (napr. chladiacimi telesami). Dodržiavajte čas vychladenia komponentov pohonu (min. 15 minút).	▲ ATENȚIE Suprafețe fierbinți (> 60 °C)! Pericol de arsuri! Nu atingeți suprafețele metalice (de ex. radiatoare de răcire). Respectați timpii de răcire ai componentelor de acționare (min. 15 minute).
▲ POZOR Nestrokovno ravnanje med transportom in nameštivjo! Nevarnost poškodb! Uporablajte ustrezne pripomočke za nameščanje in transport. Uporabite ustrezno orodje in osebno zaščitno opremo.	▲ UPOZORNENIE Neodborná manipulácia pri transporte a montáži! Nebezpečenstvo poranenia! Používajte vhodné montážne a transportné zariadenia. Používajte vhodné náradie a osobné ochranné prostriedky.	▲ ATENȚIE Manipulare necorespunzătoare la transport și montaj! Pericol de vătămare! Utilizați dispozitive adecvate de montaj și transport. Folosiți instrumente corespunzătoare și echipament personal de protecție.
▲ POZOR Nepravilno ravnanje z baterijami! Nevarnost poškodb! Ne poskušajte ponovno aktivirati ali napolniti praznih baterij (Nevarnost zaradi eksplozije ali jedkanja). Ne razstavljajte ali poškodujte nobenih baterij. Baterij ne mečite v ogenj.	▲ UPOZORNENIE Neodborná manipulácia s batériami! Nebezpečenstvo poranenia! Nepokúšajte sa reaktivovať alebo nabíjať prázdne batérie (nebezpečenstvo výbuchu a poleptania). Batérie nerozoberajte ani nepoškodzuje. Nehádzte batérie do ohňa.	▲ ATENȚIE Manipulare necorespunzătoare a bateriilor! Pericol de vătămare! Nu încercați să reactivați sau să încărcăți bateriile goale (pericol de explozie și pericol de arsuri). Nu dezasmblați și nu deteriorați bateriile. Nu aruncați bateriile în foc.

H Magyar	BG Български	LV Latviski
▲ FIGYELMEZTETÉS! Az alábbi biztonsági útmutatások figyelmen kívül hagyása életveszélyes helyzethez vezethet! Üzembe helyezés előtt olvassa el, értelmezze, és vegye figyelembe a csomagban található dokumentumban foglaltakat és a biztonsági útmutatásokat. Amennyiben a csomagban nem talál az Ön nyelvén írt dokumentumokat, vegye fel a kapcsolatot az illetékes Rexroth-képviselővel. A hajtás alkatrészein kizárólag képzett személy dolgozhat. A biztonsági útmutatókkal kapcsolatban további magyarázatot ennek a dokumentumnak az első fejezetében találhat.	▲ ПРЕДУПРЕЖДЕНИЕ Опасност за живота при неспазване на посочените подолу инструкции за безопасност! Използвайте продуктите след като сте се запознали подробно с приложената към продукта документация и указания за безопасност, разбрали сте ги и сте се съобразили с тях. Ако текстът не е написан на Вашия език, моля обърнете се към Вашия компетентен търговски представител на Rexroth. Със задвижващите компоненти трябва да работи само квалифициран персонал. Подробни пояснения към инструкциите за безопасност можете да видите в Глава 1 на тази документация.	▲ BRĪDINĀJUMS Turpinājumā doto drošības norādījumu neievērošana var apdraudēt dzīvību! Sāciet lietot izstrādājumu tikai pēc tam, kad esat pilnībā izlasījuši, sapratuši un iemēģinājuši kopā ar izstrādājumu piegādātos dokumentus. Ja dokumenti nav pieejami Jūsu valsts valodā, vērsieties pie pilnvarotā Rexroth izplatītāja. Darbus pie piedziņas komponentiem drīkst veikt tikai kvalificēts personāls. Detalizētus paskaidrojumus attiecībā uz drošības norādījumiem skatiet šī dokumenta 1. nodaļā.
▲ FIGYELMEZTETÉS! Magas elektromos feszültség! Életveszély áramütés miatt! A hajtás alkatrészeit csak véglegesen telepített védővezetővel üzemeltesse! Mielőtt hozzányúl a hajtás alkatrészeihez, kapcsolja ki az áramellátást. Ügyeljen a kondenzátorok kisülési idejére!	▲ ПРЕДУПРЕЖДЕНИЕ Високо електрическо напрежение! Опасност за живота от удар от електрически ток! Работете със задвижващите компоненти само при здраво закрепен заземяващ проводник. Преди работа по задвижващите компоненти, изключете захранващото напрежение. Обърнете внимание на времето за разреждане на кондензаторите.	▲ BRĪDINĀJUMS Augsts elektriskais spriegums! Dzīvības apdraudējums elektriskā trieciena dēļ! Piedziņas komponentus darbiniet tikai ar fiksēti uzstādītu zemējumvadu. Pirms darba pie piedziņas komponentiem atslēdziet elektroapgādi. Nemiet vērā kondensatoru izlādes laikus.

H Magyar	BG Български	LV Latviski
▲ FIGYELMEZTETÉS! Veszélyes mozgás! Életveszély! Ne tartózkodjon a gépek és a gépalkatrészek mozgási területén belül! Illetéktelen személyeket ne engedjen a gép közelébe! Mielőtt beavatkozik, vagy a veszélyes zónába belép a hajtásokat biztonságosan állítsa le.	▲ ПРЕДУПРЕЖДЕНИЕ Опасни движения! Опасност за живота! Не стойте в обсега на движение на машините и частите на машините. Не допускайте непреднамерен достъп на хора. Преди работа или влизане в опасната зона, спрете надеждно приводния механизъм.	▲ BRĪDINĀJUMS Bīstamas kustības! Dzīvības apdraudējums! Neuzturieties mašīnu un mašīnas detaļu kustību zonā. Novērsiet nepiederošu personu piekļūšanu. Pirms darba bīstamajās zonās pilnībā apstādiniet piedziņu.
▲ FIGYELMEZTETÉS! Elektromágneses / mágneses mező! Káros hatással lehet a szívritmus-szabályozó készülékkel, fémbesüléssel vagy hallókészülékkel rendelkezők egészségére! Azokra a területekre, ahol hajtások alkatrészeit szerelik és üzemeltetik, a fent említett személyeknek tilos a belépés, illetve csak orvosi konzultációt követően szabad az adott területekre lépniük.	▲ ПРЕДУПРЕЖДЕНИЕ Електромагнитни / магнитни полета! Опасност за здравето на хора със сърдечни стимулатори, метални импланти или слухови апарати! Достъпът за гореспоменатите лица до зони, в които ще се монтират и ще работят задвижващи компоненти се забранява, или разрешава само след консултация с лекар.	▲ BRĪDINĀJUMS Elektromagnētiskais / magnētiskais lauks! Veselības apdraudējums personām ar sirds stimulatoriem, metāliskiem implantiem vai dzirdes aparātiem! Tuvošanās zonām, kurās tiek montēti un darbināti piedziņas komponenti, iepriekš minētajām personām ir aizliegta, respektīvi, atļauta tikai pēc konsultēšanās ar ārstu.
▲ VIGYÁZAT! Forró felületek (> 60 °C)! Égésveszély! Ne érjen hozzá fémfelületekhez (pl. hűtőtestekhez)! Vegye figyelembe a hajtás alkatrészeinek kihűlési idejét (min. 15 perc)!	▲ ВНИМАНИЕ Горещи повърхности (> 60 °C)! Опасност от изгаряне! Не докосвайте метални повърхности (например радиатори). Съблюдавайте времето на охлаждане на задвижващите компоненти (мин. 15 минути).	▲ UZMANĪBU Karstas virsmas (> 60 °C)! Apdedzināšanās risks! Neskarities pie metāliskām virsmām (piemēram, dzesētāja). Ļaujiet piedziņas komponentiem atdzist (min. 15 minūtes).
▲ VIGYÁZAT! Szakszerűtlen kezelés szállításkor és szereléskor! Sérülésveszély! A megfelelő beszerelési és szállítási eljárásokat alkalmazza! Használjon megfelelő szerszámokat és személyes védőfelszerelést!	▲ ВНИМАНИЕ Неправилно боравене по време на транспорт и монтаж! Опасност от нараняване! Използвайте подходящо монтажно и транспортно оборудване. Използвайте подходящи инструменти и лични предпазни средства.	▲ UZMANĪBU Nepareizi veikta transportēšana un montāža! Traumu gūšanas risks! Izmantojiet piemērotas montāžas un transportēšanas ierīces. Izmantojiet piemērotus instrumentus un individuālos aizsardzības līdzekļus.
▲ VIGYÁZAT! Akkumulátorok szakszerűtlen kezelése! Sérülésveszély! Üres akkumulátorokat ne aktiváljon újra, illetve ne töltsön fel (robbanás- és marásveszély)! Az akkumulátorokat ne szedje szét, és ne rongálja meg! Az akkumulátort ne dobja tűzbe!	▲ ВНИМАНИЕ Неправилно боравене с батерии! Опасност от нараняване! Не се опитвайте да активирате отново или да зареждате разредени батерии (Опасност от експлозия и напръскване с агресивен агент). Не разглобявайте и не повреждайте батерии. Не хвърляйте батерии в огън.	▲ UZMANĪBU Nepareiza bateriju lietošana! Traumu gūšanas risks! Nemēģiniet no jauna aktivizēt vai uzlādēt tukšas baterijas (eksploziju un ķīmisko apdegumu draudi). Neizjauciet un nesabojājat baterijas. Nemetiet baterijas ugunī.

LT Lietuviškai	EST Eesti	GR Ελληνικά
⚠️ ĮSPĖJIMAS Pavojus gyvybei nesilaikant toliau pateikiamų saugumo nurodymų! Naudokite gaminį tik kruopščiai perskaitę prie jo pridėtus aprašus, saugumo nurodymus. Susipažinkite su jais ir vadovaukitės naudodami gaminį. Jei Jūs negavote aprašo gimtąja kalba, kreipkitės į įgaliotus Rexroth atstovus. Prie pavaros komponentų leidžiama dirbti tik kvalifikuotam personalui. Išsamesnius saugumo nurodymų paaiškinimus rasite šios dokumentacijos 1 skyriuje.	⚠️ HOIATUS Alljärgnevat ohutusjuhiste eiramine on eluohtlik! Võtke tooted kaiku alles siis, kui olete toodetega kaasasolevad materjalid ning ohutusjuhised täielikult läbi lugenud, neist aru saanud ja neid järginud. Kui Teil puuduvad emakeelsed materjalid, siis pöörduge Rexrothi kohaliku müügiesinduse poole. Ajamikomponentidega tohib töötada üksnes kvalifitseeritud personal. Täpsemad selgitusi ohutusjuhiste kohta leiate käesoleva dokumentatsiooni peatükist 1.	⚠️ ΠΡΟΕΙΔΟΠΟΙΗΣΗ Κίνδυνος θανάτου σε περίπτωση μη συμμόρφωσης με τις παρακάτω οδηγίες ασφαλείας! Θέστε το προϊόν σε λειτουργία αφού διαβάσετε, κατανοήσετε και λάβετε υπόψη το σύνολο των οδηγιών ασφαλείας που το συνοδεύουν. Εάν δεν υπάρχει τεκμηρίωση στη γλώσσα σας, απευθυνθείτε σε εξουσιοδοτημένο αντιπρόσωπο της Rexroth. Μόνο εξειδικευμένο προσωπικό επιτρέπεται να χειρίζεται στοιχεία μετάδοσης κίνησης. Περαιτέρω επεξηγήσεις των οδηγιών ασφαλείας διατίθενται στο κεφάλαιο 1 της παρούσας τεκμηρίωσης.
⚠️ ĮSPĖJIMAS Aukšta elektros įtampa! Pavojus gyvybei dėl elektros smūgio! Pavaros komponentus eksploatuokite tik su fiksuotai instaliuotu apsauginiu laidu. Prieš priedami prie pavaros komponentų išjunkite maitinimo įtampą. Atsižvelkite į kondensatorių išsikrovimo trukmę.	⚠️ HOIATUS Kõrge elektripinge! Eluohtlik elektrilöögi tõttu! Käituge ajamikomponente üksnes püsivalt installeeritud maandusega. Lülitage enne ajamikomponentidega tööde alustamist toitepinge välja. Järgige kondensaatorite mahalaadumisaegu.	⚠️ ΠΡΟΕΙΔΟΠΟΙΗΣΗ Υψηλή ηλεκτρική τάση! Κίνδυνος θανάτου από ηλεκτροπληξία! Θέτετε σε λειτουργία τα στοιχεία μετάδοσης κίνησης μόνο εφόσον έχει τοποθετηθεί καλά προστατευτικός αγωγός γείωσης. Πριν από οποιαδήποτε παρέμβαση, αποσυνδέστε την τροφοδοσία των στοιχείων μετάδοσης κίνησης. Λάβετε υπόψη τους χρόνους αποφόρτισης των πυκνωτών.
⚠️ ĮSPĖJIMAS Pavojingi judesiai! Pavojus gyvybei! Nebūkite mašinų ar jų dalių judėjimo zonoje. Neleiskite netyčia patekti asmenims. Prieš patekdam į pavojaus zoną saugiai išjunkite pavaras.	⚠️ HOIATUS Ohtlikud liikumised! Eluohtlik! Ärge viibige masina ja masinaosade liikumispiirkonnas. Tõkestage inimeste ettekavatsematu sisenemine masina ja masinaosade liikumispiirkonda. Tagage ajamite turvaline seiskamine enne ohupiirkonda juurdepääsu või sisenemist.	⚠️ ΠΡΟΕΙΔΟΠΟΙΗΣΗ Επικίνδυνες τάσεις! Κίνδυνος θανάτου! Μην στέκεστε στην περιοχή κίνησης μηχανημάτων και εξαρτημάτων. Αποτρέπετε την τυχαία είσοδο ατόμων. Πριν από την παρέμβαση ή πρόσβαση στην περιοχή κινδύνου, μεριμνήστε για την ασφαλή ακινητοποίηση των συστημάτων μετάδοσης κίνησης.
⚠️ ĮSPĖJIMAS Elektromagnetiniai / magnetiniai laukai! Pavojus asmenų su širdies stimulatoriais, metaliniais implantais arba klausos aparatais sveikatai! Prieiga prie zonų, kuriose montuojami ir eksploatuojami pavaros komponentai, aukščiau nurodytiems asmenims yra draudžiama arba leistina tik pasitarus su gydytoju.	⚠️ HOIATUS Elektromagnetilised / magnetilised väljad! Terviseohtlik südamestimulaatorite, metallimplantaatide ja kuulmiseadmetega inimestele! Sisenemine piirkondadesse, kus toimub ajamikomponentide monteerimine ja käitamine, on ülalnimetatud isikutele keelatud või lubatud üksnes pärast arstiga konsulteerimist.	⚠️ ΠΡΟΕΙΔΟΠΟΙΗΣΗ Ηλεκτρομαγνητικά/ μαγνητικά πεδία! Κίνδυνος για την υγεία ατόμων με καρδιακούς βηματοδότες, μεταλλικά εμφυτεύματα ή συσκευές ακοής! Η είσοδος σε περιοχές όπου πραγματοποιείται συναρμολόγηση και λειτουργία στοιχείων μετάδοσης κίνησης απαγορεύεται στα προαναφερθέντα άτομα, εκτός αν τους έχει δοθεί σχετική άδεια κατόπιν συνεννόησης με γιατρό.
⚠️ PERSPĖJIMAS Karšti paviršiai (> 60 °C)! Nudegimo pavojus! Venkite liesti metalinius paviršius (pvz., radiatorių). Išlaikykite pavaros komponentų atvėsimo trukmę (bent 15 minučių).	⚠️ ETTEVAATUST Kuumad välispinnad (> 60 °C)! Põletusohut! Vältige metalsete välispindade (nt radiaatorid) puudutamist. Pidage kinni ajamikomponentide mahajahtumisajast (vähemalt 15 minutit).	⚠️ ΠΡΟΣΟΧΗ Καυτές επιφάνειες (> 60 °C)! Κίνδυνος εγκαύματος! Αποφεύγετε την επαφή με μεταλλικές επιφάνειες (π.χ. μονάδες ψύξης). Λάβετε υπόψη το χρόνο ψύξης των στοιχείων μετάδοσης κίνησης (τουλάχιστον 15 λεπτά).

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⚠ PERSPĖJIMAS Netinkamas darbas transportuojant ir montuojant! Susižalojimo pavojus! Naudokite tinkamus montavimo ir transportavimo įrenginius. Naudokite tinkamus įrankius ir asmens saugos priemonės.	⚠ ETTEVAATUST Asjatundmatu käsitsemine transportimisel ja montaažil! Vigastusoht! Kasutage sobivaid montaaži- ja transpordiseadiseid. Kasutage sobivaid tööriistu ja isiklikku kaitsevarustust.	⚠ ΠΡΟΣΟΧΗ Ακατάλληλος χειρισμός κατά τη μεταφορά και συναρμολόγηση! Κίνδυνος τραυματισμού! Χρησιμοποιείτε κατάλληλους μηχανισμούς συναρμολόγησης και μεταφοράς. Χρησιμοποιείτε κατάλληλα εργαλεία και ατομικό εξοπλισμό προστασίας.
⚠ PERSPĖJIMAS Netinkamas darbas su baterijomis! Susižalojimo pavojus! Nebandykite tuščių baterijų reaktyvuoti arba įkrauti (sprogimo ir išėdinimo pavojus). Neardykite ir nepažeiskite baterijų. Nemeskite baterijų į ugnį.	⚠ ETTEVAATUST Patareide asjatundmatu käsitsemine! Vigastusoht! Ärge üritage kunagi tühje patareisid reaktiveerida või täis laadida (plahvatus- ja söövitusoht). Ärge demonteerige ega kahjustage patareisid. Ärge visake patareisid tulle.	⚠ ΠΡΟΣΟΧΗ Ακατάλληλος χειρισμός μπαταριών! Κίνδυνος τραυματισμού! Μην επιδιώκετε να ενεργοποιήσετε ξανά ή να φορτίσετε κενές μπαταρίες (κίνδυνος έκρηξης και διάβρωσης). Μην διαλύετε ή καταστρέφετε τις μπαταρίες. Μην απορρίπτετε τις μπαταρίες στη φωτιά.

CN 中文
⚠ 警告 如果不按照下述指定的安全说明使用，将会导致人身伤害！ 在没有阅读，理解随本产品附带的文件并熟知正当使用前，不要安装或使用本产品。 如果没有您所在国家官方语言文件说明，请与 Rexroth 销售伙伴联系。 只允许有资格人员对驱动器部件进行操作。 安全说明的详细解释在本文档的第一章。
⚠ 警告 高电压！电击导致生命危险！ 只有在安装了永久良好的设备接地导线后才可以对驱动器的部件进行操作。 在接触驱动器部件前先将驱动器部件断电。 确保电容放电时间。
⚠ 警告 危险运动！生命危险！ 保证设备的运动区域内和移动部件周围无障碍物。 防止人员意外进入设备运动区域内。 在接近或进入危险区域之前，确保传动设备安全停止。
⚠ 警告 电磁场/磁场！对佩戴心脏起搏器、金属植入物和助听器的人员会造成严重的人身伤害！ 上述人员禁止进入安装及运行的驱动器区域，或者必须事先咨询医生。
⚠ 小心 热表面（大于 60 度）！灼伤风险！ 不要触摸金属表面（例如散热器）。驱动器部件断电后需要时间进行冷却（至少 15 分钟）。
⚠ 小心 安装和运输不当导致受伤危险！当心受伤！ 使用适当的运输和安装设备。 使用适合的工具及用适当的防护设备。
⚠ 小心 电池操作不当！受伤风险！ 请勿对低电量电池重新激活或重新充电（爆炸和腐蚀的危险）。 请勿拆解或损坏电池。请勿将电池投入明火中。

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1 Important Notes

1.1 Safety Instructions

1.1.1 General Information

- Do not attempt to install and operate the components of the electric drive and control system without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with these components. If you do not have the user documentation for the components, contact your responsible Rexroth sales partner. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the components.
- If the supplied documents contain some information you do not understand, it is absolutely necessary that you ask Rexroth for explanation before you start working at or with the components.
- If the component is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the component in the official language of the user's country.
- Only qualified persons may work with components of the electric drive and control system or within its proximity.

In terms of this Instruction Manual, qualified persons are those persons who are familiar with the installation, mounting, commissioning and operation of the components of the electric drive and control system, as well as with the hazards this implies, and who possess the qualifications their work requires. To comply with these qualifications, it is necessary, among other things,

- to be trained, instructed or authorized to switch electric circuits and components safely on and off, to ground them and to mark them,
- to be trained or instructed to maintain and use adequate safety equipment,
- to attend a course of instruction in first aid.
- The technical data, connection and installation conditions of the components are specified in the respective application documentations and must be followed at all times.
- If the components take the form of hardware, then they must remain in their original state, in other words, no structural changes are permitted. It is not permitted to decompile software components or alter source codes.
- Do not mount damaged or faulty components or use them in operation.
- Only use accessories and spare parts approved by Rexroth.
- Follow the safety regulations and requirements of the country in which the electric components of the electric drive and control system are operated.
- Proper and correct transport, storage, mounting and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of the component.

Improper use of these components, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, could result in property damage, injury, electric shock or even death.

Important Notes

1.1.2 Protection Against Contact With Electrical Parts and Housings



This section concerns components of the electric drive and control system with voltages of **more than 50 volts**.

Contact with parts conducting voltages above 50 volts can cause personal danger and electric shock. When operating components of the electric drive and control system, it is unavoidable that some parts of these components conduct dangerous voltage.

High electrical voltage! Danger to life, risk of injury by electric shock or serious injury!

- Only qualified persons are allowed to operate, maintain and/or repair the components of the electric drive and control system.
- Follow the general installation and safety regulations when working on power installations.
- Before switching on, the equipment grounding conductor must have been permanently connected to all electric components in accordance with the connection diagram.
- Even for brief measurements or tests, operation is only allowed if the equipment grounding conductor has been permanently connected to the points of the components provided for this purpose.
- Before accessing electrical parts with voltage potentials higher than 50 V, you must disconnect electric components from the mains or from the power supply unit. Secure the electric component from reconnection.
- With electric components, observe the following aspects:
 - Always wait **30 minutes** after switching off power to allow live capacitors to discharge before accessing an electric component. Measure the electrical voltage of live parts before beginning to work to make sure that the equipment is safe to touch.
- Install the covers and guards provided for this purpose before switching on.
- Never touch electrical connection points of the components while power is turned on.
- Do not remove or plug in connectors when the component has been powered.
- Under specific conditions, electric drive systems can be operated at mains protected by residual-current-operated circuit-breakers sensitive to universal current (RCDs/RCMs).
- Secure built-in devices from penetrating foreign objects and water, as well as from direct contact, by providing an external housing, for example a control cabinet.

High housing voltage and high leakage current! Danger to life, risk of injury by electric shock!

- Before switching on and before commissioning, ground or connect the components of the electric drive and control system to the equipment grounding conductor at the grounding points.

Important Notes

- Connect the equipment grounding conductor of the components of the electric drive and control system permanently to the main power supply at all times. The leakage current is greater than 3.5 mA.
- Establish an equipment grounding connection with a minimum cross section according to the table below. With an outer conductor cross section smaller than 10 mm² (8 AWG), the alternative connection of two equipment grounding conductors is allowed, each having the same cross section as the outer conductors.

Cross section outer conductor	Minimum cross section equipment grounding conductor Leakage current ≥ 3.5 mA	
	1 equipment grounding conductor	2 equipment grounding conductors
1,5 mm ² (AWG 16)	10 mm ² (AWG 8)	2 × 1,5 mm ² (AWG 16)
2,5 mm ² (AWG 14)		2 × 2,5 mm ² (AWG 14)
4 mm ² (AWG 12)		2 × 4 mm ² (AWG 12)
6 mm ² (AWG 10)		2 × 6 mm ² (AWG 10)
10 mm ² (AWG 8)		-
16 mm ² (AWG 6)	16 mm ² (AWG 6)	-
25 mm ² (AWG 4)		-
35 mm ² (AWG 2)		-
50 mm ² (AWG 1/0)	25 mm ² (AWG 4)	-
70 mm ² (AWG 2/0)	35 mm ² (AWG 2)	-
...	...	...

Fig. 1-1: Minimum Cross Section of the Equipment Grounding Connection

1.1.3 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of connected motors. Some common examples are:

- Improper or wrong wiring or cable connection
- Operator errors
- Wrong input of parameters before commissioning
- Malfunction of sensors and encoders
- Defective components
- Software or firmware errors

These errors can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring functions in the components of the electric drive and control system will normally be sufficient to avoid malfunction in the connected drives. Regarding personal safety, especially the danger of injury and/or property damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

Important Notes

Dangerous movements! Danger to life, risk of injury, serious injury or property damage!

A **risk assessment** must be prepared for the installation or machine, with its specific conditions, in which the components of the electric drive and control system are installed.

As a result of the risk assessment, the user must provide for monitoring functions and higher-level measures on the installation side for personal safety. The safety regulations applicable to the installation or machine must be taken into consideration. Unintended machine movements or other malfunctions are possible if safety devices are disabled, bypassed or not activated.

To avoid accidents, injury and/or property damage:

- Keep free and clear of the machine's range of motion and moving machine parts. Prevent personnel from accidentally entering the machine's range of motion by using, for example:
 - Safety fences
 - Safety guards
 - Protective coverings
 - Light barriers
- Make sure the safety fences and protective coverings are strong enough to resist maximum possible kinetic energy.
- Mount emergency stopping switches in the immediate reach of the operator. Before commissioning, verify that the emergency stopping equipment works. Do not operate the machine if the emergency stopping switch is not working.
- Prevent unintended start-up. Isolate the drive power connection by means of OFF switches/OFF buttons or use a safe starting lockout.
- Make sure that the drives are brought to safe standstill before accessing or entering the danger zone.
- Additionally secure vertical axes against falling or dropping after switching off the motor power by, for example,
 - mechanically securing the vertical axes,
 - adding an external braking/arrester/clamping mechanism or
 - ensuring sufficient counterbalancing of the vertical axes.
- The standard equipment **motor holding brake** or an external holding brake controlled by the drive controller is **not sufficient to guarantee personal safety!**
- Disconnect electrical power to the components of the electric drive and control system using the master switch and secure them from reconnection ("lock out") for:
 - Maintenance and repair work
 - Cleaning of equipment
 - Long periods of discontinued equipment use
- Prevent the operation of high-frequency, remote control and radio equipment near components of the electric drive and control system and their supply leads. If the use of these devices cannot be avoided, check the machine or installation, at initial commissioning of the electric drive and control system, for possible malfunctions when operating such high-frequency, remote control and radio equipment in its possible positions of

Important Notes

normal use. It might possibly be necessary to perform a special electromagnetic compatibility (EMC) test.

1.1.4 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated by current-carrying conductors or permanent magnets of electric motors represent a serious danger to persons with heart pacemakers, metal implants and hearing aids.

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electric components!

- Persons with heart pacemakers and metal implants are not allowed to enter the following areas:
 - Areas in which components of the electric drive and control systems are mounted, commissioned and operated.
 - Areas in which parts of motors with permanent magnets are stored, repaired or mounted.
- If it is necessary for somebody with a heart pacemaker to enter such an area, a doctor must be consulted prior to doing so. The noise immunity of implanted heart pacemakers differs so greatly that no general rules can be given.
- Those with metal implants or metal pieces, as well as with hearing aids, must consult a doctor before they enter the areas described above.

1.1.5 Protection Against Contact With Hot Parts

Hot surfaces of components of the electric drive and control system. Risk of burns!

- Do not touch hot surfaces of, for example, braking resistors, heat sinks, supply units and drive controllers, motors, windings and laminated cores!
- According to the operating conditions, temperatures of the surfaces can be **higher than 60 °C** (140 °F) during or after operation.
- Before touching motors after having switched them off, let them cool down for a sufficient period of time. Cooling down can require **up to 140 minutes!** The time required for cooling down is approximately five times the thermal time constant specified in the technical data.
- After switching chokes, supply units and drive controllers off, wait **15 minutes** to allow them to cool down before touching them.
- Wear safety gloves or do not work at hot surfaces.
- For certain applications, and in accordance with the respective safety regulations, the manufacturer of the machine or installation must take measures to avoid injuries caused by burns in the final application. These measures can be, for example: Warnings at the machine or installation, guards (shieldings or barriers) or safety instructions in the application documentation.

1.1.6 Protection During Handling and Mounting

Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!

Important Notes

- Observe the relevant statutory regulations of accident prevention.
- Use suitable equipment for mounting and transport.
- Avoid jamming and crushing by appropriate measures.
- Always use suitable tools. Use special tools if specified.
- Use lifting equipment and tools in the correct manner.
- Use suitable protective equipment (hard hat, safety goggles, safety shoes, safety gloves, for example).
- Do not stand under hanging loads.
- Immediately clean up any spilled liquids from the floor due to the risk of falling!

1.1.7 Battery Safety

Batteries consist of active chemicals in a solid housing. Therefore, improper handling can cause injury or property damage.

Risk of injury by improper handling!

- Do not attempt to reactivate low batteries by heating or other methods (risk of explosion and cauterization).
- Do not attempt to recharge the batteries as this may cause leakage or explosion.
- Do not throw batteries into open flames.
- Do not dismantle batteries.
- When replacing the battery/batteries, do not damage the electrical parts installed in the devices.
- Only use the battery types specified for the product.



Environmental protection and disposal! The batteries contained in the product are considered dangerous goods during land, air, and sea transport (risk of explosion) in the sense of the legal regulations. Dispose of used batteries separately from other waste. Observe the national regulations of your country.

1.2 Appropriate Use

This product may only be used for the applications mentioned in the additional documentations (see index entry "Additional documentations") and under the described application, ambient and operating conditions.

This product is exclusively intended for use in machines and systems in an industrial environment. This is to be understood as applications according to IEC 60204-1 "Safety of machinery, Electric equipment of machines" and NFPA 79 "Electrical Standard for Industrial Machinery".

Important Notes



Components of the Rexroth IndraDrive system are **products of category C3** (with limited availability) according to IEC 61800-3. To ensure that this category (limit values) is maintained, suitable line filters must be used in the drive system.

These components are not provided for use in a public low-voltage network supplying residential areas with power. If these components are used in such a public network, high-frequency interference is to be expected. This can require additional measures of radio interference suppression.

2 Identification

2.1 Type Code



The figure illustrates the basic structure of the type code. Our sales representative will help you with the current status of available versions.

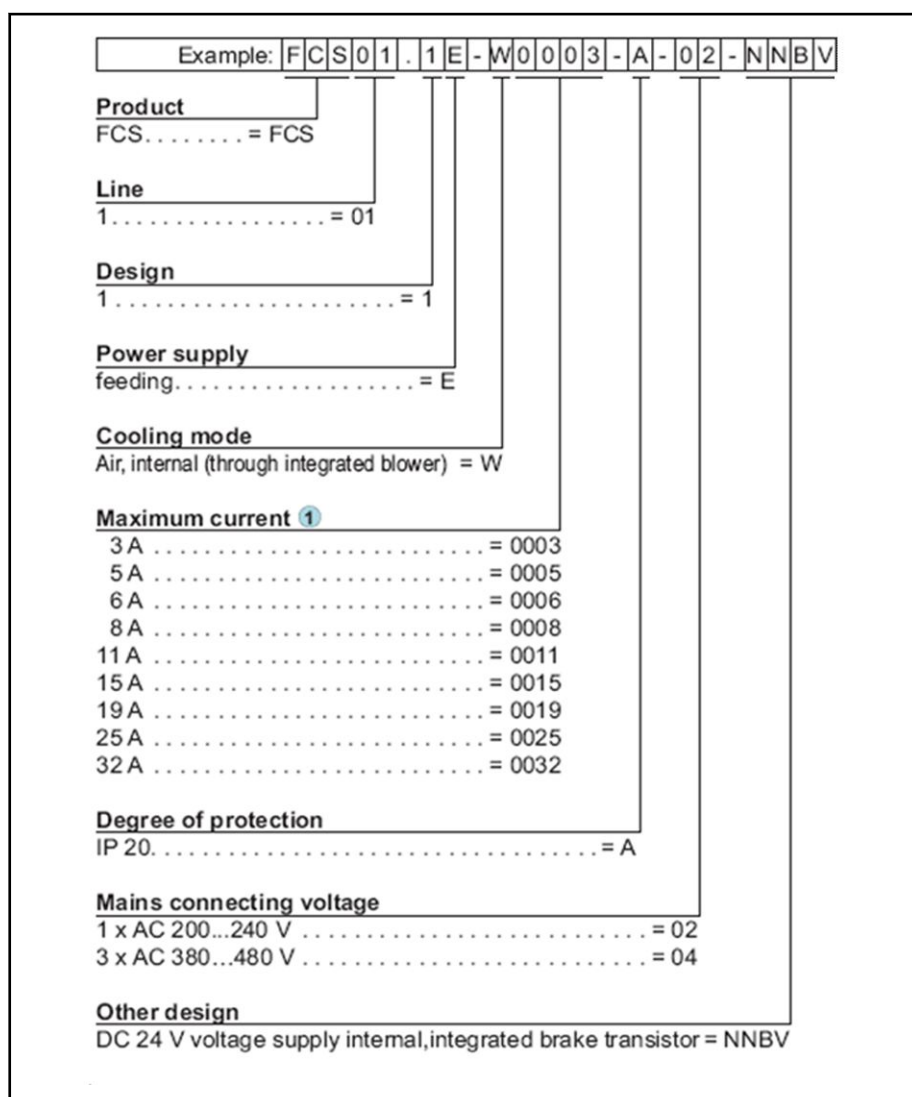


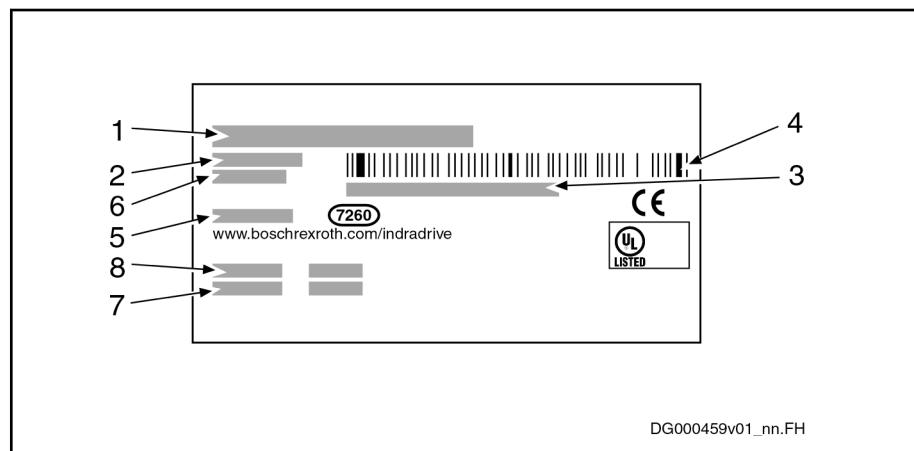
Fig.2-1: Type Code FCS01

Identification

2.2 Type Plates

Type Plate (Power Sections, Supply Units)

The FCS01 frequency converters have been UL-listed (E227957).



- | | |
|---|---|
| 1 | Device type |
| 2 | Part number |
| 3 | Serial number |
| 4 | Bar code |
| 5 | Country of manufacture |
| 6 | Production week; 08W23, for example, means year 2008, week 23 |
| 7 | Hardware index |
| 8 | Firmware version as supplied |
- Fig. 2-2: Type Plate IndraDrive FC*

2.3 Scope of Supply

Immediately after receipt/unpacking, check the device for transport damages such as deformation or loose parts.

In case of damage, contact the forwarder at once and arrange for a thorough review of the situation.



This is also applicable if the packaging is undamaged.

Standard Design

- FCS01 frequency converter, degree of protection IP20
- FCB firmware
- Integrated brake chopper
- Integrated EMC mains filter for limit curve A according to EN55011
- Cover for the function module slot
- Shield clip for control terminals
- Cover for the control terminals
- Instruction Manual

3 Ratings and Dimensions

3.1 Technical Data

3.1.1 General Data FCS01

Function	Specification
Output frequency	0.0... 400.0 Hz
Pulse frequency fs	3.0... 16.0 kHz; standard setting: 6 kHz Derating with 230V devices from fs > 8 kHz Derating with 400V devices from fs > 6 kHz
Typ. overload capability	150% for 60 s, 200% for 3.5 s
Protection against	Overtemperature of the frequency converter, short circuit, ground fault, overvoltage and undervoltage, overload, no-load operation
Closed-loop and open-loop control	Sensorless current vector control (ISD), linear U/f characteristic
Analog command value input / PID input	2x 0... 10 V, 0/4... 20 mA, scalable
Analog command value resolution	10-bit related to measuring range
Analog output	0... 10V scalable
Command value constancy	Analog < 1% Digital < 0.02%
Motor temperature monitoring	I ² t motor (UL/cUL approved), PTC / bimetal switch (not UL/cUL)
Digital input	5 * 7.5... 30V (2.5V); Ri = 6.1 kohm (2.2 kohm); cycle time = 1... 2 ms
Galvanic isolation	Control terminals of the digital and analog inputs
Ramp times	0... 320.0 s
Control outputs	2x relay 28V DC / 230V AC, 2A
Interfaces	Standard: RS 485 (USS), RS 232 (single slave) Optional: Profibus DP; CANopen, DeviceNet
Frequency converter efficiency	Approx. 95%
Ambient temperature	0°C... +40°C (S1-100% ED), 0°C... +50°C (S3-75% ED 10 min)
Storage and transport temperature	-25°C... +70°C
Long-time storage	Connect the frequency converter to mains voltage for a period of 60 minutes after expiry of one year at the latest. This cycle must be maintained over the whole storage period.
Degree of protection	IP20 (for installation in control cabinet)
Max. installation altitude / power reduction	Up to 1000 m above sea level: None 1000... 4,000 m above sea level: 1%/100 m
Overvoltage category	Up to 2000 m: Overvoltage category 3 2000... 4000 m: Overvoltage category 2, external overvoltage protection required at the mains input
Delay time between two mains activation cycles	60 s for all devices, in normal operation cycle

Ratings and Dimensions

Function		Specification	
Terminals	Mains/Motor/ Braking resistor	0,2... 4 mm ² stranded wire with ferrules 0,2... 6 mm ² solid wire AWG 24... 10	Tightening torque: 0.5... 0.6 Nm
	Control section	0.4... 1.5 mm ² solid or stranded wire with ferrules AWG 26... 16	
	Relay	0.14... 1.5 mm ² stranded wire with ferrules, 0.14... 2.5 mm ² solid wire AWG 26... 14	
	RS485 / RS232	1x RJ12 (6-pin)	
	CANbus	--	

Fig.3-1: General Data FCS01

3.1.2 Electrical Data

Electrical Data of the 230V Devices

Size A					
Device type:	FCS01.1E	-W0003-A-02	-W0005-A-02	-W0006-A-02	-W0008-A-02
Rated motor power (4-pole standard motor)	230 V	0.25 kW	0.37 kW	0.55 kW	0.75 kW
	240 V	1/3 hp	1/2 hp	3/4 hp	1 hp
Mains phases	Number	1 / 3 AC			
Mains voltage		200... 240V, $\pm 10\%$, 47... 63 Hz			
System impedance		Min. 100 μ H per phase			
Output voltage		3 AC 0 mains voltage			
Rated output current	rms [A]	1.7	2.2	3.0	4.0
Min. braking resistance	Accessory	240 Ω	190 Ω	140 Ω	100 Ω
Typ. input current 1/3 AC	rms [A]	3.7 / 2.4	4.8 / 3.1	6.5 / 4.2	8.7 / 5.6
Recom. mains fuse 1/3 AC	Slow [A]	10 / 10	10 / 10	16 / 10	16 / 10
Type of ventilation		Free convection			
Weight	Approx. [kg]	1,4			

Fig.3-2: Electrical Data of the 230V Devices (Size A)

Size B				
Device type:	FCS01.1E	W0011-A-02	W0015-A-02	W0019-A-02
Rated motor power (4-pole standard motor)	230 V	1.1 kW	1.5 kW	2.2 kW
	240 V	1½ hp	2 hp	3 hp
Mains phases	Number	1 / 3 AC		
Mains voltage		200... 240 V, $\pm 10\%$, 47... 63 Hz		
System impedance		Min. 100 μ H per phase		
Output voltage		3 AC 0 mains voltage		
Rated output current	rms [A]	5.5	7.0	9.0 (9.5)
Min. braking resistance	Accessory	75 Ω	62 Ω	43 Ω
Typ. input current 1/3 AC	rms [A]	12.0 / 7.7	15.2 / 9.8	19.6 / 13.3
Recom. mains fuse 1/3 AC	Slow [A]	16 / 16	20 / 16	25 / 20
Type of ventilation		Fan cooling, temperature-controlled		
Weight	Approx. [kg]	1,8		

Fig.3-3: Electrical Data of the 230V Devices (Size B)

Ratings and Dimensions

Electrical Data of the 400V Devices

Size A/B					
Device type:	FCS01.1E	W0003-A-04	W0005-A-04	W0006-A-04	W0008-A-04
Rated motor power (4-pole standard motor)	400 V	0.55 kW	0.75 kW	1.1 kW	1.5 kW
	480 V	¾ hp	1 hp	1½ hp	2 hp
Mains phases	Number	3 AC			
Mains voltage		380... 480V, -20% / +10%, 47 ... 63 Hz			
System impedance		Min. 50 µH per phase			
Output voltage		3 AC 0 mains voltage			
Rated output current	rms [A]	1.7	2.3	3.1	4.0
Min. braking resistance	Accessory	390 Ω	300 Ω	220 Ω	180 Ω
Typ. input current	rms [A]	2.4	3.2	4.3	5.6
Recom. mains fuse	Slow [A]	10	10	10	10
Type of ventilation		Free convection			
Weight	Approx. [kg]	1,4		1,8	

Fig.3-4: Electrical Data of the 400V Devices (Size A/B)

Size B/C/D						
Device type:	FCS01.1E	W0011-A-04	W0015-A-04	W0019-A-04	W0025-A-04	W0032-A-04
Rated motor power (4-pole standard motor)	400 V	2.2 kW	3.0 kW	4.0 kW	5.5 kW	7.5 kW
	480 V	3 hp	4 hp	5 hp	7½ hp	10 hp
Mains phases	Number	3 AC				
Mains voltage		380... 480 V, -20% / +10%, 47 ... 63 Hz				
System impedance		Min. 50 µH per phase				
Output voltage		3 AC 0 mains voltage				
Rated output current	rms [A]	5.5	7.5	9.5	12.5	16.0
Min. braking resistance	Accessory	130 Ω	91 Ω	75 Ω	56 Ω	43 Ω
Typ. input current	rms [A]	7.7	10.5	13.3	17.5	22.4
Recom. mains fuse	Slow [A]	10	16	16	20	25
Type of ventilation		Fan cooling, temperature-controlled				
Weight	Approx. [kg]	1,8	2,7		3,1	

Fig.3-5: Electrical Data of the 400V Devices (Size B/C/D)

3.1.3 Electrical Data for UL Approval

The data specified in this paragraph must be considered to comply with the UL approval.

Size A - 230 V mains					
Device type:	FCS01.1E	-W0003-A-02	-W0005-A-02	-W0006-A-02	-W0008-A-02
Rated motor power (4-pole standard motor)	220V	0.25 kW	0.37 kW	0.55 kW	0.75 kW
	240V	1/3 hp	1/2 hp	3/4 hp	1 hp
FLA 1/3 AC	[A]	4 / 3	5 / 4	7 / 5	9 / 6
Recom. mains fuse	J Class Fuse	LPJ 10A	LPJ 10A	LPJ 16A / 10A	LPJ 16A / 10A

Fig. 3-6: Electrical Data for UL Approval (Size A - 230V Mains)

Size B - 230V mains				
Device type:	FCS01.1E	W0011-A-02	W0015-A-02	W0019-A-02
Rated motor power (4-pole standard motor)	220V	1.1 kW	1.5 kW	2.2 kW
	240V	1 1/2 hp	2 hp	3 hp
FLA 1/3 AC	[A]	11 / 8	14 / 10	19 / 13
Recom. mains fuse	J Class Fuse	LPJ 16A	LPJ 16A	LPJ 20A

Fig. 3-7: Electrical Data for UL Approval (Size B - 230V Mains)

Size A/B - 400V mains		A		B		
Device type:	FCS01.1E	W0003-A-04	W0005-A-04	W0006-A-04	W0008-A-04	W0011-A-04
Rated motor power (4-pole standard motor)	380V	0.55 kW	0.75 kW	1.1 kW	1.5 kW	2.2 kW
	460...480V	3/4 hp	1 hp	1 1/2 hp	2 hp	3 hp
FLA 1/3 AC	[A]	4	4	5	6	8
Recom. mains fuse	J Class Fuse	LPJ 10A	LPJ 10A	LPJ 10A	LPJ 10A	LPJ 10A

Fig. 3-8: Electrical Data for UL Approval (Size A/B - 400V Mains)

Size C/D - 400V mains		C		D	
Device type:	FCS01.1E	W0015-A-04	W0019-A-04	W0025-A-04	W0032-A-04
Rated motor power (4-pole standard motor)	380V	3.0 kW	4.0 kW	5.5 kW	7.5 kW
	460...480V	4 hp	5 hp	7 1/2 hp	10 hp
FLA 1/3 AC	[A]	11	13	17	21
Recom. mains fuse	J Class Fuse	LPJ 16A	LPJ 16A	LPJ 20A	LPJ 25A

Fig. 3-9: Electrical Data for UL Approval (Size C/D - 400V Mains)

Ratings and Dimensions

3.2 Dimensions of the FCS01 Frequency Converter

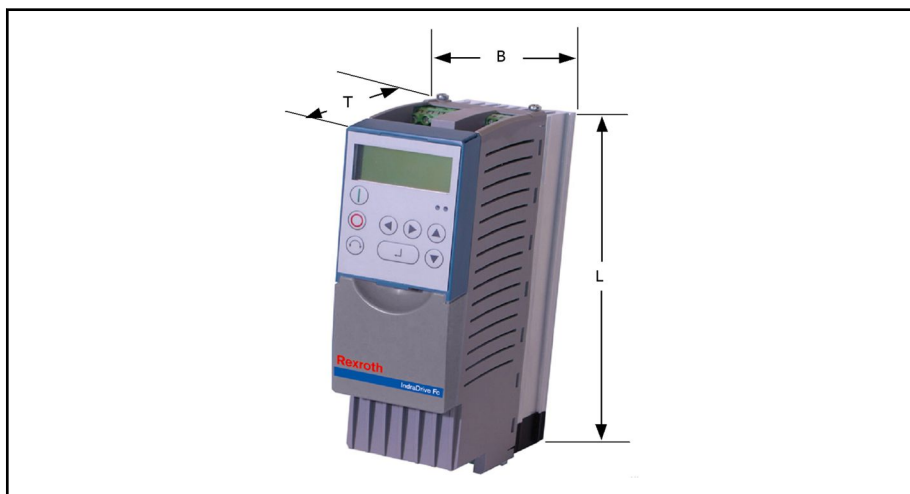


Fig.3-10: Dimensions of the IndraDrive Fc Frequency Converters

Device type	Size	Housing dimensions [mm]			Wall mounting bracket [mm]	
		L	W	D	L1, approx.	Ø
FCS01.1E-W0003-A-02	A	186	73	151	220	5.5
FCS01.1E-W0005-A-02						
FCS01.1E-W0006-A-02						
FCS01.1E-W0008-A-02						
FCS01.1E-W0003-A-04						
FCS01.1E-W0005-A-04						
FCS01.1E-W0011-A-02	B	226	73	151	260	5.5
FCS01.1E-W0015-A-02						
FCS01.1E-W0019-A-02						
FCS01.1E-W0006-A-04						
FCS01.1E-W0011-A-04						
FCS01.1E-W0015-A-04	C	241	98	178	275	5.5
FCS01.1E-W0019-A-04						
FCS01.1E-W0025-A-04	D	286	98	178	320	5.5
FCS01.1E-W0032-A-04						

Fig.3-11: Dimensions of the FCS01 Frequency Converters

3.3 Installation

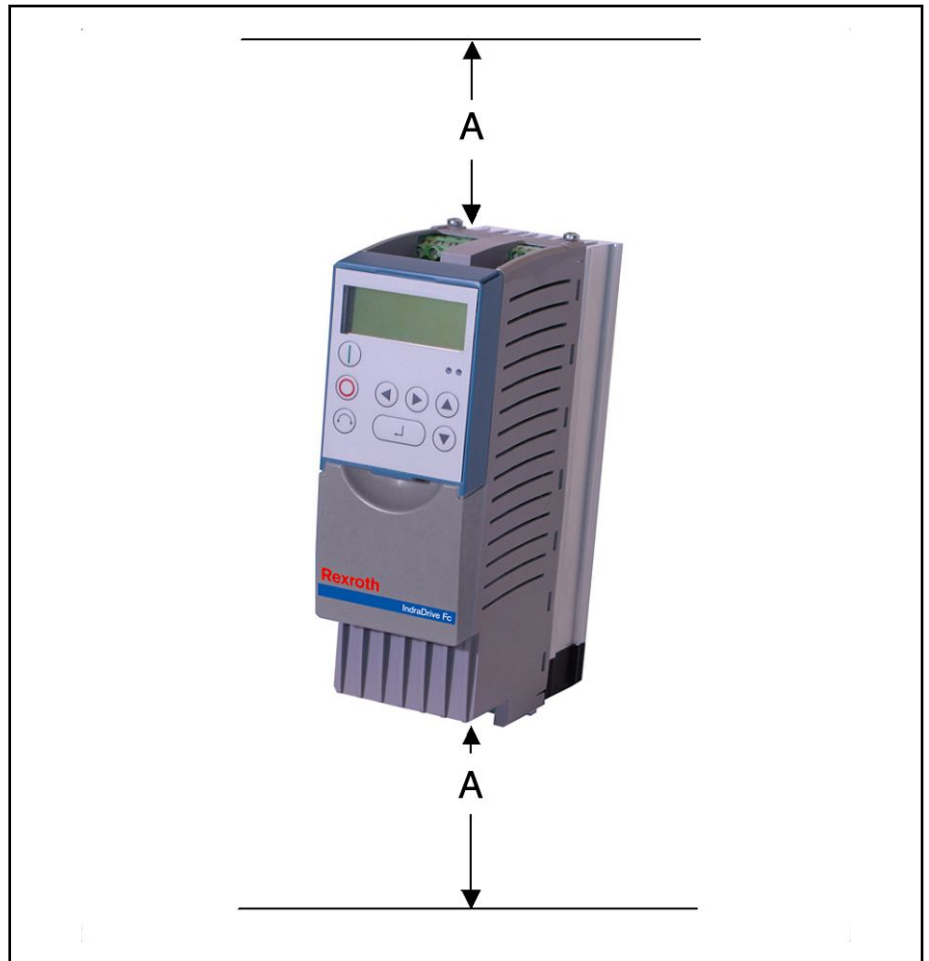
The FCS01 frequency converters are supplied in different sizes, depending on the power. When mounting the frequency converter, observe the allowed mounting position.

To be protected from overheating, the devices must be sufficiently ventilated. For this purpose, guide values apply for minimum distances above and below the frequency converter, and to neighboring components which might disturb the air flow.

Ratings and Dimensions



Mounting without additional lateral space between the frequency converters is allowed. The mounting position is vertical.



A ≥ 100 mm

Fig.3-12: Vertical Mounting Position



Warm air must be dissipated above the devices!

If several frequency converters are arranged above one another, make sure that the top limit of the air intake temperature is not exceeded. If the limit is exceeded, we recommend that you mount an "obstacle" (e.g., a cable duct) between the frequency converters which will interrupt the direct air flow (rising warm air).

Efficiency: For installation in a control cabinet, ensure sufficient ventilation. During operation, dissipation heat is approx. 5% (depending on the device size and equipment) of the nominal power of the frequency converter.

4 Reference Documentations

4.1 Documentations - Overview

Title	Type of documentation	Document typecode ¹⁾
Rexroth IndraDrive Additional Components	Project Planning Manual	DOK-INDRV*-ADDCOMP*****-PRxx-EN-P
Rexroth Connection Cables	Selection Data	DOK-CONNEC-CABLE*STAND-AUxx-EN-P
Third-Party Motors	Project Planning and Commissioning Manual	DOK-DRIVE*-3RDPART*MOT-AWxx-EN-P
Safety Instructions for Electric Drives	Safety Guidelines	DOK-GENERAL-DRIVE*****-SVSx-MS-P

1) In the document typecodes, "xx" is a wild card for the current edition of the documentation (example: PR01 is the first edition of a Project Planning Manual)

Fig. 4-1: Documentations - Overview

5 Instructions for Use

5.1 Wiring Directives

5.1.1 General Information

The frequency converters have been developed for operation in an industrial environment. In this environment, the frequency converter may be exposed to high degrees of electromagnetic interferences. Usually, correct installation guarantees smooth operation free of trouble and risks. To ensure that the limit values of the EMC directives are complied with, the following aspects should be observed.

- Make sure that all devices in the control cabinet or in the field are grounded as specified, by means of short grounding lines with a large cross-section which are connected to a common grounding point or ground bus. It is very important that each control unit (e.g. automation device) connected to the frequency converters is linked by means of a short line with a large cross-section to the same grounding point as the converter. Flat lines (e.g. metal U-clamps) are preferable as their impedance with high frequencies is lower. If possible, the PE conductor of the motor controlled by the frequency converter should be connected directly to the ground connection linked to the heat sink, together with the PE of the supply feeder of the respective frequency converter. Usually, smooth operation is guaranteed if a central ground bus is provided and all equipment grounding conductors are connected to this bus.

See also chapter 6 "EMC Measures for Design and Installation"

- Use shielded lines for control circuits where possible. The shield should terminate at the end of the line. Make sure that the wires do not run unshielded over long distances.
- The shield of the control lines should be grounded only on the frequency converter side.
- Run the control lines separately from the load lines if possible, by using separate cable ducts etc. Lay cables at crossing points at 90° angles if possible.
- Make sure that interference suppression has been provided for the contactors in the control cabinets, either - for a.c. contactors - by an RC circuit or - for d.c. contactors - by free-wheeling diodes. **Note that the interference suppressors must be mounted to the contactor coils.** Varistors are also effective for overvoltage limiting. This interference suppression is of special importance if the contactors are controlled by the relays in the converter.
- Use shielded or armored cables for the load connections (motor cables), and ground the shielding/armor at both ends. Grounding must be effected directly on the well conducting mounting plate of the control cabinet or the EMC kit shield angle.
- When the drive is to be operated in an environment sensitive to electromagnetic interference, we recommend that you use radio interference filters (observe degree of protection) to limit the conducted and radiated interferences of the frequency converter. Mount the filter as close as possible to the converter and ground it well.
- Furthermore, it is imperative to observe the directives for EMC-compatible wiring.

See also chapter 6 "EMC Measures for Design and Installation"

Instructions for Use

- Select the lowest possible switching frequency. This reduces the intensity of the electromagnetic interference generated by the converter.



It is imperative that the safety regulations are observed when installing the frequency converters!



Control lines, mains lines and motor lines must be run separately. They must never be laid in one common cable pipe/duct. The test equipment for high voltage insulation must not be used for cables connected to the frequency converter.

5.1.2 Line Routing and Shielding at Function Modules

Where no EMC measures have been taken, high-frequency interferences primarily caused by switching operations or lightning frequently result in faults in electronic components of the bus nodes; therefore, trouble-free operation is no longer guaranteed.

Professionally shielded bus cables dampen the potential electrical interferences of an industrial environment. Take the following measures to realize optimum shielding properties:

- Keep the connections between bus nodes as short as possible.
- The shielding of the bus cable must be placed on both sides over a large surface area.
- Avoid connecting field devices to the bus via branch circuits.
- Avoid extending bus cables via connectors.



In the case of different potentials to ground, a compensating current may flow through the shield connected on both sides which is a potential risk to the electronic components. Equipotential differences must be reduced by sufficient equipotential bonding.

5.1.3 EMC Limit Value Classes to be Achieved

The limit value classes listed below can be achieved when the following conditions are met:

Device type max. motor cable, shielded	Jumper position	Conducted emission 150 kHz – 30 MHz	
	See chapter 5.2.3	Class A 1 (C2)	Class B 1 (C1)
FCS01.1E-W0003-A-02... FCS01.1E-W0019-A-02	2 - 1	20 m	5 m
	2 - 2	5 m	--
FCS01.1E-W0003-A-04... FCS01.1E-W0032-A-04	2 - 1	20 m	5 m
	2 - 2	5 m	--

Noise Immunity

According to the product standard for drive systems: EN 61800-3

Overview of standards applying as test methods and measuring methods in accordance with the product standard EN 61800-3 for adjustable speed electrical power drive systems:		
Noise emission		
Conducted emission (interference voltage)	EN 55011	A 1 or C2
		B 1 or C1
Radiated emission (interference-field strength)	EN 55011	A 1 or C2
		-
Noise immunity EN 61000-6-1, EN 61000-6-2		
ESD, discharge of static electricity	EN 61000-4-2	6kV (CD), 8kV (AD)
EMF, high-frequency electromagnetic fields	EN 61000-4-3	10 V/m; 80 - 1000 MHz
Burst on control lines	EN 61000-4-4	1 kV
Burst on mains lines and motor lines	EN 61000-4-4	2 kV
Surge (phase-phase / ground)	EN 61000-4-5	1 kV / 2 kV
Conducted disturbance by high-frequency fields	EN 61000-4-6	10 V, 0.15 - 80 MHz
Voltage fluctuations and voltage dips	EN 61000-2-1	+10%, -15%; 90%
Voltage asymmetries and frequency changes	EN 61000-2-4	3%; 2%

Fig.5-1: Noise Immunity

5.1.4 Wiring Recommendations for Power Connections



Connect the cable shield on both sides, i.e. at the shield angle of the frequency converter housing and at the motor terminal box.

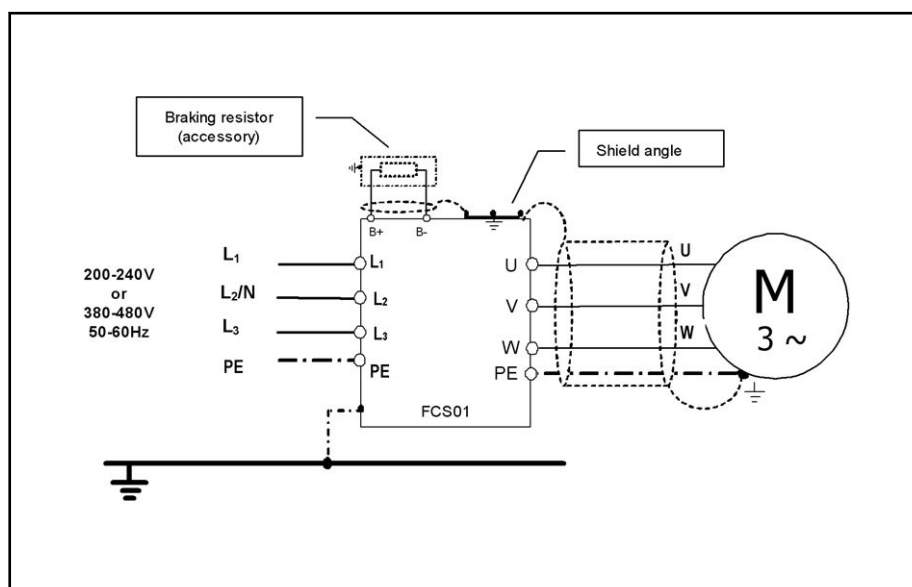


Fig.5-2: Wiring

Instructions for Use

5.2 Electrical Connection

5.2.1 General Information

⚠ WARNING**THESE DEVICES MUST BE GROUNDED.**

⇒ Professional mounting and commissioning by qualified personnel in accordance with the instructions in this Instruction Manual is a precondition for the safe operation of the device. Specifically, the general and regional mounting and safety instructions for working with electrical power installations (e.g. VDE) and the regulations concerning professional utilization of tools and the use of personal safety equipment must be observed. At the power input and the motor terminals, dangerous voltage may be applied even while the converter is deactivated. Always use insulated screwdrivers at these terminal panels. Make sure that the input voltage source has been de-energized before establishing or modifying connections to the unit. Check that the frequency converter and the motor are sized for the correct supply voltage.

The mains connection and pilot relay terminals are situated on the top of the frequency converter. The motor connection and braking resistor terminals are situated on the bottom of the frequency converter.

The control terminals are situated on the front of the frequency converter. To reach them, push the terminal cover downwards and pull it off. Now, the terminals are accessible from the front.

Re-fit all covers before switching on the supply voltage!

The following must be observed:

- Make sure that the voltage source supplies the correct voltage and has been sized for the required current (see also chapter 3 Technical Data). Make sure that suitable power circuit breakers with the specified nominal current range have been connected between the voltage source and the frequency converter.
- Connect the mains voltage directly to the mains terminals **L₁-L₂/N-L₃-PE**.
- Use a four-core cable to connect the motor. The cable is connected to the motor terminals **PE-U-V-W**.
- If shielded motor cable is used as recommended, place the cable shield over a large surface area on the metallic mounting surface of the control cabinet.



It is imperative to use shielded cables to comply with the specified degree of radio interference suppression.

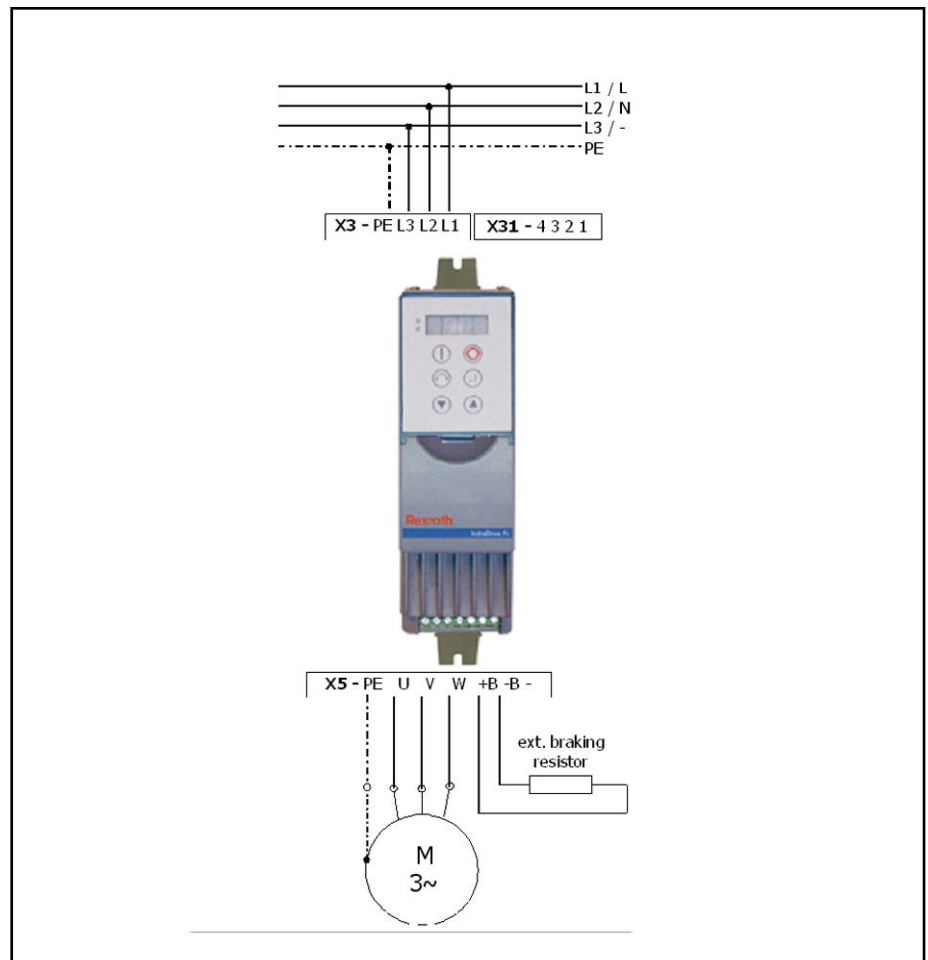


Fig. 5-3: Electrical Power Connection



When **ferrules** are used, the maximum connectable line cross section may be reduced.

The control connections are situated under the terminal cover of the frequency converter.

Terminals:

Plug-in clamp connectors are unlocked with a small screwdriver.

Maximum connection cross section:

1.0 mm² (26-14 AWG)

Relay = 1.5 mm² (26-16 AWG)

Control lines:

Run and shield separately from mains/motor lines

Control voltages:

5V ± 20%, max. 250 mA

(short-circuit proof) 10V, max. 5 mA, reference voltage for an ext. potentiometer

15V ± 20%, max. 150 mA, for supplying the dig. inputs

Analog output 0... 10V, max. 20 mA, for an ext. display unit

Instructions for Use



AGND and DGND are common reference potentials for analog or digital inputs. If applicable, 5V/15V can be picked off by several terminals. The sum of the picked-off currents must not exceed 250 mA/150 mA.

5.2.2 X2 Terminal Block

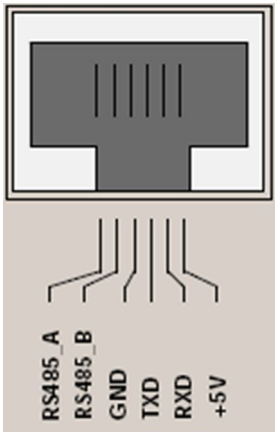
Terminal	Function	Data	Description / suggested wiring	Parameters
Terminal block X2 (RJ12), RS485/RS232 at the top of the device				
(1) RS485 A	Data cable RS485	Baud rate		P502... P513
(2) RS485 B		9600... 38400 Baud		
(3) GND	Reference potential of the bus signals	0V digital		
(4) 232 TXD	Data cable RS232	Baud rate		
(5) 232 RXD		9600... 38400 Baud		
(6) +5V	5V power supply	5V, $\pm 20\%$, 250 mA		
			RJ12: Pin 1...6	

Fig.5-4: X2 Terminal Block

5.2.3 X3, Mains Connection (PE, L1, L2/N, L3)

General Information

The frequency converter does not require any specific kind of fusing at the power input side. We recommend that you use the usual mains fuses and a main switch or contactor.

See also chapter 3 "Technical Data"

230V devices of up to 2.2 kW may either be operated with 1-phase 230V (L/N = L1/L2) or with 3-phase 230V (L1/L2/L3).

All 400V devices and devices ≥ 3 kW must only be supplied with 3-phase mains voltage (L1/L2/L3).

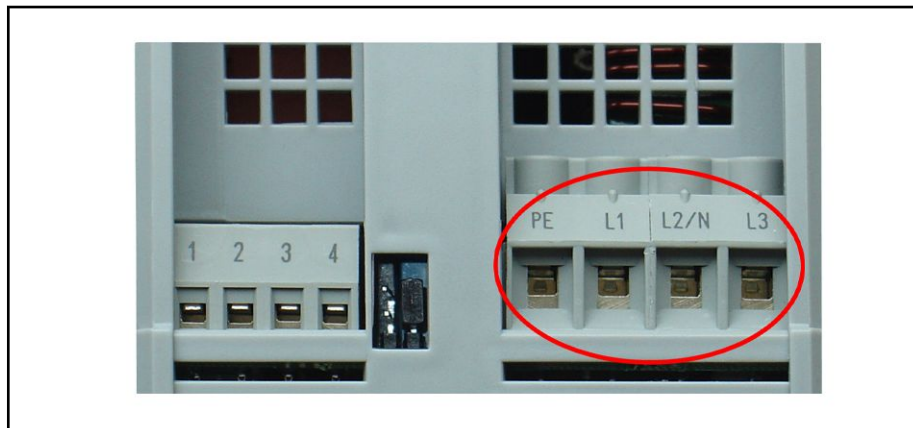


Fig.5-5: Mains Connection

Operation with Residual-Current-Operated Circuit-Breaker

The frequency converters FCS01 have been sized for operation with a 30 mA residual-current-operated circuit-breaker sensitive to universal current.

If **several FCS01** frequency converters are operated at a residual-current-operated circuit-breaker, the leakage currents must be reduced against PE.

Operation in IT Mains

General Information

Via jumpers at the top and bottom of the device, the FCS01 frequency converters can be set for operation at IT mains and for reduction of leakage currents.

At the Top of the Device (Mains Input)



Fig.5-6: Mains Input Jumper in Position "2"

Setting	Position	Effect
	0	Operation at the IT mains
	1	No effect
	2	Standard position (condition as supplied)

Fig.5-7: Jumper Position at the Top

Instructions for Use

At the Bottom of the Device (Motor Output)

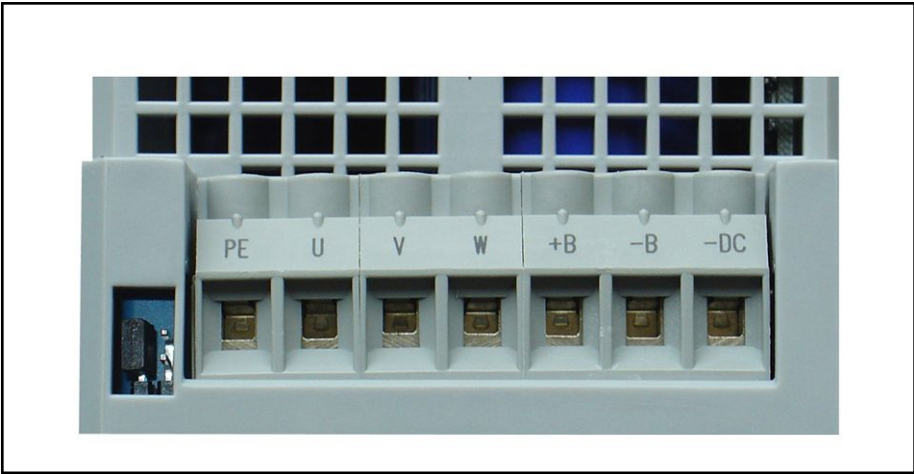


Fig.5-8: Motor Output Jumper in Position "1"

Setting	Position	Effect
	0	Operation at the IT mains
	1	Standard position (condition as supplied)
	2	Reduced leakage current; operation with residual-current-operated circuit-breaker

Fig.5-9: Jumper Position at the Bottom

Operation	Position of jumper at top of device	Position of jumper at bottom of device	Explanation
IT mains	0	0	
Residual-current-operated circuit-breaker	0, 1 or 2	2	

Fig.5-10: Settings

Be aware that the specified degree of radio interference suppression may change with the different settings. For details please see chapter 6 "EMC Measures for Design and Installation".

Effect of the Settings in the Device

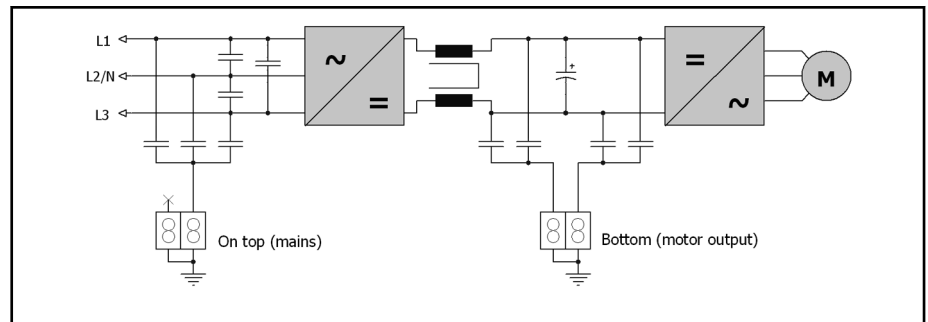


Fig.5-11: Internal Effect of the Settings

5.2.4 X5, Connection of Motor Cable (PE, U, V, W)

The motor cable can have a **total length of 100 m** if it is a standard type. If you use a shielded cable or run the cable in a well-grounded metallic cable duct, the **total length should not exceed 30 m**.



See also chapter 6 "EMC Measures for Design and Installation"



For operation with several motors, the total motor cable length is the sum of all individual cable lengths.

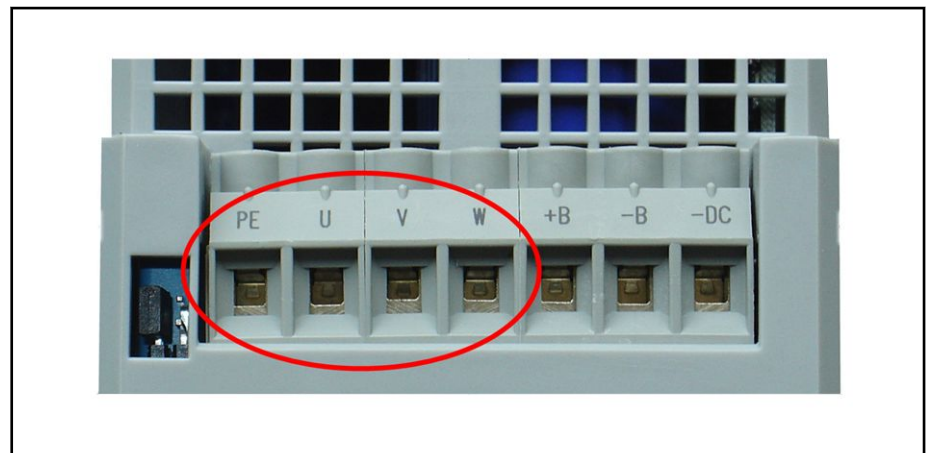


Fig.5-12: Motor Cable

5.2.5 X5, Connection of Braking Resistor (+B, -B)

The terminals +B/-B are provided for connection of a suitable braking resistor. For the connection, select a twisted and shielded line which is as short as possible (maximum allowed length 2 x 5 m).

Instructions for Use

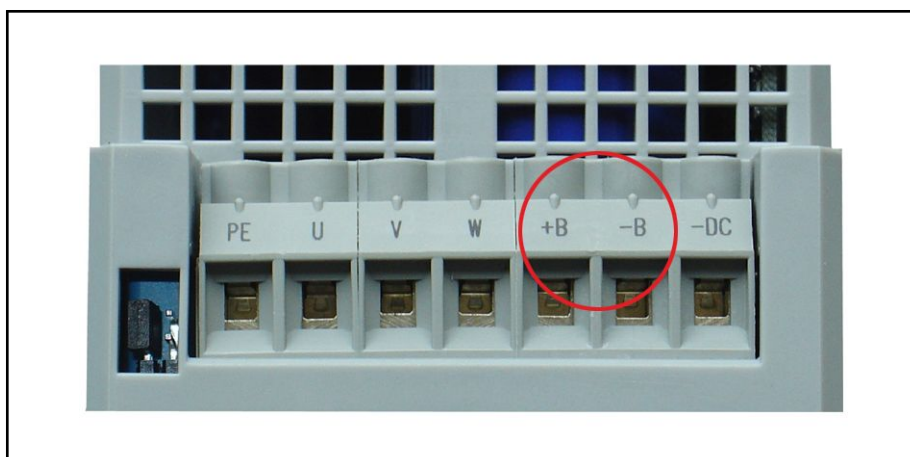


Fig.5-13: Connection of Braking Resistor



The braking resistor heats up during operation.

- Place the braking resistor at a sufficient distance from heat-sensitive components.
- Provide sufficient ventilation for the braking resistor.
- The use of the FLR01 braking resistor is not UL/cUL-certified.

⚠ WARNING

Damage to the device due to incorrect connection!

⇒ Exclusively connect the braking resistor between +B and -B; particularly avoid short circuit against ground.

5.2.6 X5, DC Coupling (+B, -DC)

DC coupling with FCS01 makes sense when drives in one installation simultaneously work in a motive and a regenerative manner. In this process, the energy from the regenerative drive is supplied back to the motive drive. This is of advantage in view of energy consumption and utilization of braking resistors.

Note the following aspects:

- Keep the connecting line between +B and -DC as short as possible.
- Make sure that the coupling is not provided before readiness for operation is signaled. Otherwise, there is the risk that the DC bus capacitors of all frequency converters are charged by only one frequency converter.
- Make sure that the coupling is disconnected if one of the devices is no longer operative.
- Use a braking resistor (possibly of low capacity) to ensure high availability.
- It is only allowed to use the frequency converters without a mains choke if devices of identical capacity (identical type) are coupled and identical system impedances take effect (identical cable length to mains bar).

Otherwise, provide a mains choke in the supply feeder of each frequency converter.

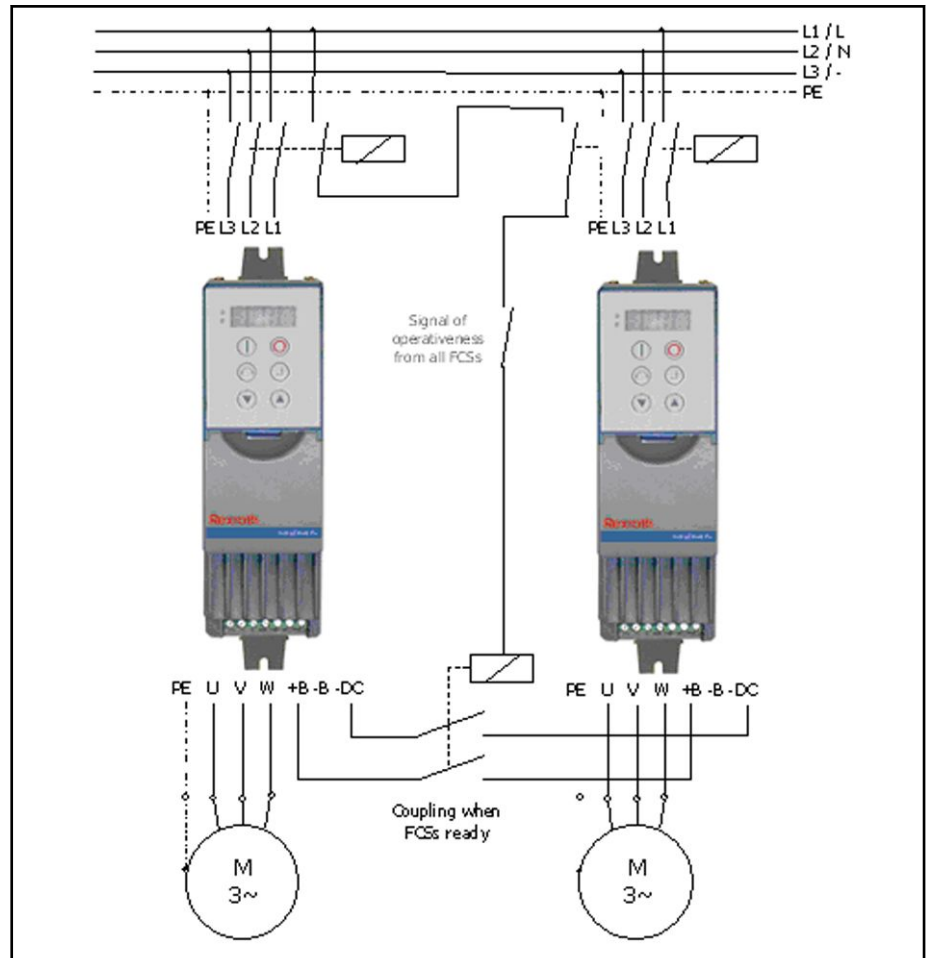


Fig.5-14: Connection of Braking Resistor

5.2.7 X31, Relay 1 (1, 2), Relay 2 (3, 4)

Set the function of these relays according to your requirements with the parameters P434 through P443. They may be operated with max. 230V AC/24V DC, 2A.

In factory setting, the closed contact signals the frequency converter's readiness for operation at the terminals 3-4 (relay 2). When an error message is pending or when the frequency converter is de-energized, the contact is open.

The terminals 1-2 (relay 1) can control a mechanical motor brake in the factory setting. Only in this way is the brake released and applied again at the right moment. To optimize the temporal sequence, set the respective delay (0.2 - 0.3 s) in parameter P107.

Instructions for Use

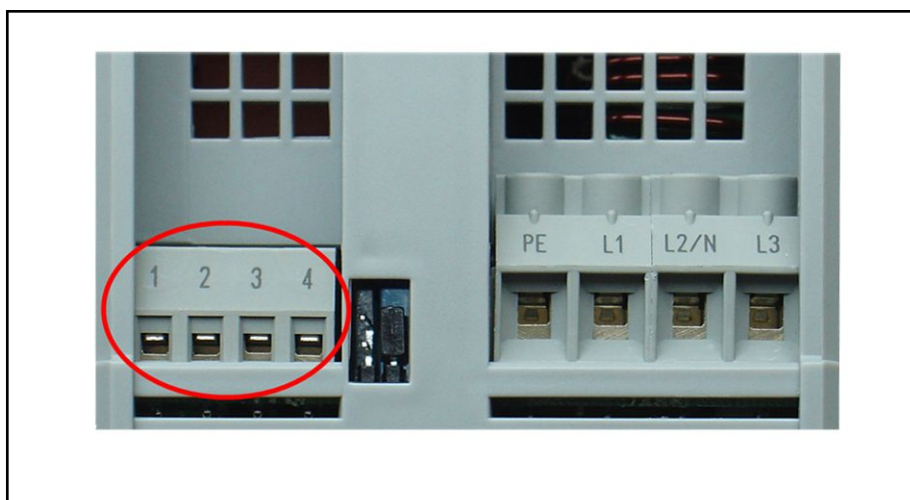


Fig.5-15: Relay Connection

Terminal	Function	Data	Description / suggested wiring	Parameters
Terminal block X31 (at the top of the device)				
1 K1.12 K1.2	Relay 1	N/O contact 230V AC / 24V DC, 2A	Brake control	P434
3 K2.14 K2.2	Relay 2		Error / operative	P441

Fig.5-16: Terminal Block X31

5.2.8 X35 Terminal Block

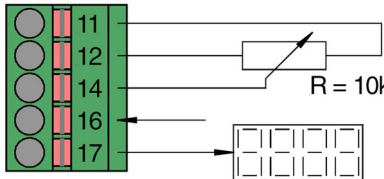
Terminal	Function	Data	Description / suggested wiring	Parameters
Terminal block X35 (at the front of the device)				
11 VO +10V	10V reference voltage	10 V, 5 mA	The analog input controls the output frequency of the frequency converter 	
12 AGND/0V	Reference potential of the analog signals	0 V analog		
14 AIN1	Analogue input 1	0...10V, R _i = 10kΩ, 0/4...20mA, R _i = 250Ω, can be switched with DIP switch, reference potential AGND		P400
16 AIN2	Analogue input 2			P405
17 AOUT1	Analogue output	0...10 V, 20 mA, reference potential AGND	Can be used for external display or further processing in a secondary machine.	P418

Fig.5-17: X35 Terminal Block

5.2.9 X36 Terminal Block

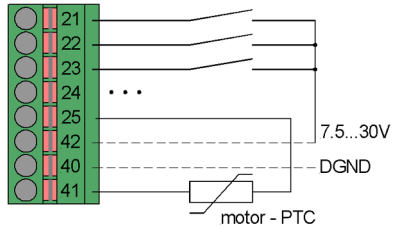
Terminal	Function	Data	Description / suggested wiring	Parameters
Terminal block X36 (at the front of the device)				
21 DIG1	Digital input 1	7.5... 30 V, $R_i = 6.1 \text{ k}\Omega$		P420
22 DIG2	Digital input 2			P421
23 DIG3	Digital input 3			P422
24 DIG4	Digital input 4			P423
25 DIG5	Digital input 5	2.5... 3 0V, $R_i = 2.2 \text{ k}\Omega$, suitable for PTC thermistor evaluation with +5V supply		P424
42 VO +15V	15V power supply	15V, $\pm 20\%$, 150 mA		
40 DGND	Reference potential of the digital signals	0 V digital		
41 VO +5V	5V power supply	5 V, $\pm 20\%$, 250 mA	Power supply for motor PTC	

Fig.5-18: X36 Terminal Block

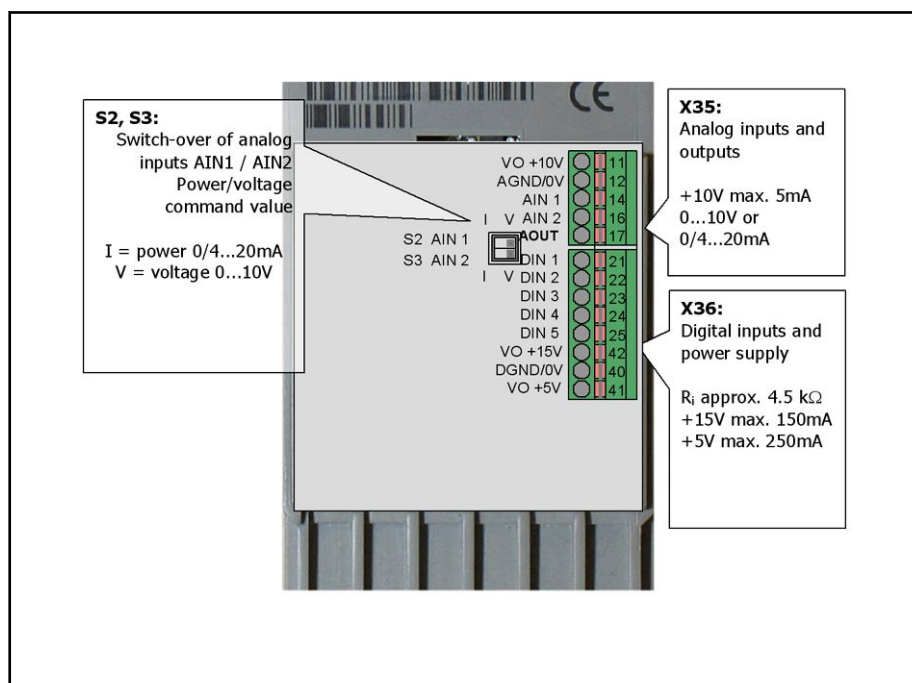


Fig.5-19: Electrical Control Connection

6 EMC Measures for Design and Installation

6.1 Rules for Design of Installations With Drive Controllers in Compliance With EMC

The following rules are the basics for designing and installing drives in compliance with EMC.

Mains filter	Correctly use a mains filter recommended by Rexroth for radio interference suppression in the supply feeder of the drive system.
Control Cabinet Grounding	Connect all metal parts of the cabinet with one another over the largest possible surface area to establish a good electrical connection. This, too, applies to the mounting of the mains filter. If required, use serrated washers which cut through the paint surface. Connect the cabinet door to the control cabinet using the shortest possible grounding straps.
Line Routing	Avoid coupling routes between lines with high potential of noise and noise-free lines; therefore, signal, mains and motor lines and power cables have to be routed separately from another. Minimum distance: 10 cm. Provide separating sheets between power and signal lines. Ground separating sheets several times. The lines with high potential of noise include: • Lines at the mains connection (incl. synchronization connection) • Lines at the motor connection • Lines at the DC bus connection Generally, interference injections are reduced by routing cables close to grounded sheet steel plates. For this reason, cables and wires should not be routed freely in the cabinet, but close to the cabinet housing or mounting panels. Separate the incoming and outgoing cables of the radio interference suppression filter.
Interference Suppression Elements	Provide the following components in the control cabinet with interference suppression combinations: • Contactors • Relays • Solenoid valves • Electromechanical operating hours counters Connect these combinations directly at each coil.
Twisted Wires	Twist unshielded wires belonging to the same circuit (feeder and return cable) or keep the surface between feeder and return cable as small as possible. Wires that are not used have to be grounded at both ends.
Lines of Measuring Systems	Lines of measuring systems must be shielded. Connect the shield to ground at both ends and over the largest possible surface area. The shield may not be interrupted, e.g. using intermediate terminals.
Digital Signal Lines	Ground the shields of digital signal lines at both ends (transmitter and receiver) over the largest possible surface area and with low impedance. In the case of bad ground connection between transmitter and receiver, additionally route a bonding conductor (min. 10 mm ²). Braided shields are better than foil shields.
Analog Signal Lines	Ground the shields of analog signal lines at one end (transmitter or receiver) over the largest possible surface area and with low impedance. This avoids low-frequency interference current (in the mains frequency range) on the shield.

EMC Measures for Design and Installation

Connecting the Mains Choke Keep connection lines of the mains choke at the drive controller as short as possible and twist them.

- Installing the Motor Power Cable**
- Use shielded motor power cables or run motor power cables in a shielded duct
 - Use the shortest possible motor power cables
 - Ground shield of motor power cable at both ends over the largest possible surface area to establish a good electrical connection
 - Run motor lines in shielded form inside the control cabinet
 - Do not use any steel-shielded lines
 - The shield of the motor power cable mustn't be interrupted by mounted components, such as output chokes, sine filters or motor filters

6.2 EMC-Optimal Installation in Facility and Control Cabinet

6.2.1 General Information

For EMC-optimal installation, a spatial separation of the interference-free area (mains connection) and the interference-susceptible area (drive components) is recommended, as shown in the figures below.



Recommendation: For EMC-optimal installation in the control cabinet, use a separate control cabinet panel for the drive components.

6.2.2 Division Into Areas (Zones)

Exemplary arrangements in the control cabinet: See section [Control Cabinet Design According to Interference Areas - Exemplary Arrangements](#), page 50.

We distinguish three areas:

1. Interference-free area of control cabinet (**area A**):

This includes:

- Supply feeder, input terminals, fuse, main switch, mains side of mains filter for drives and corresponding connecting lines
- Control voltage or auxiliary voltage connection with power supply unit, fuse and other parts unless connection is run via the mains filter of the AC drives
- All components that are not electrically connected with the drive system

2. Interference-susceptible area (**area B**):

- Mains connections between drive system and mains filter for drives, mains contactor
- Interface lines of drive controller

3. Strongly interference-susceptible area (**area C**):

- Motor power cables including single cores

Never run lines of one of these areas in parallel with lines of another area so that there isn't any unwanted interference injection from one area to the other and that the filter is jumpered with regard to high frequency. Use the shortest possible connecting lines.

EMC Measures for Design and Installation

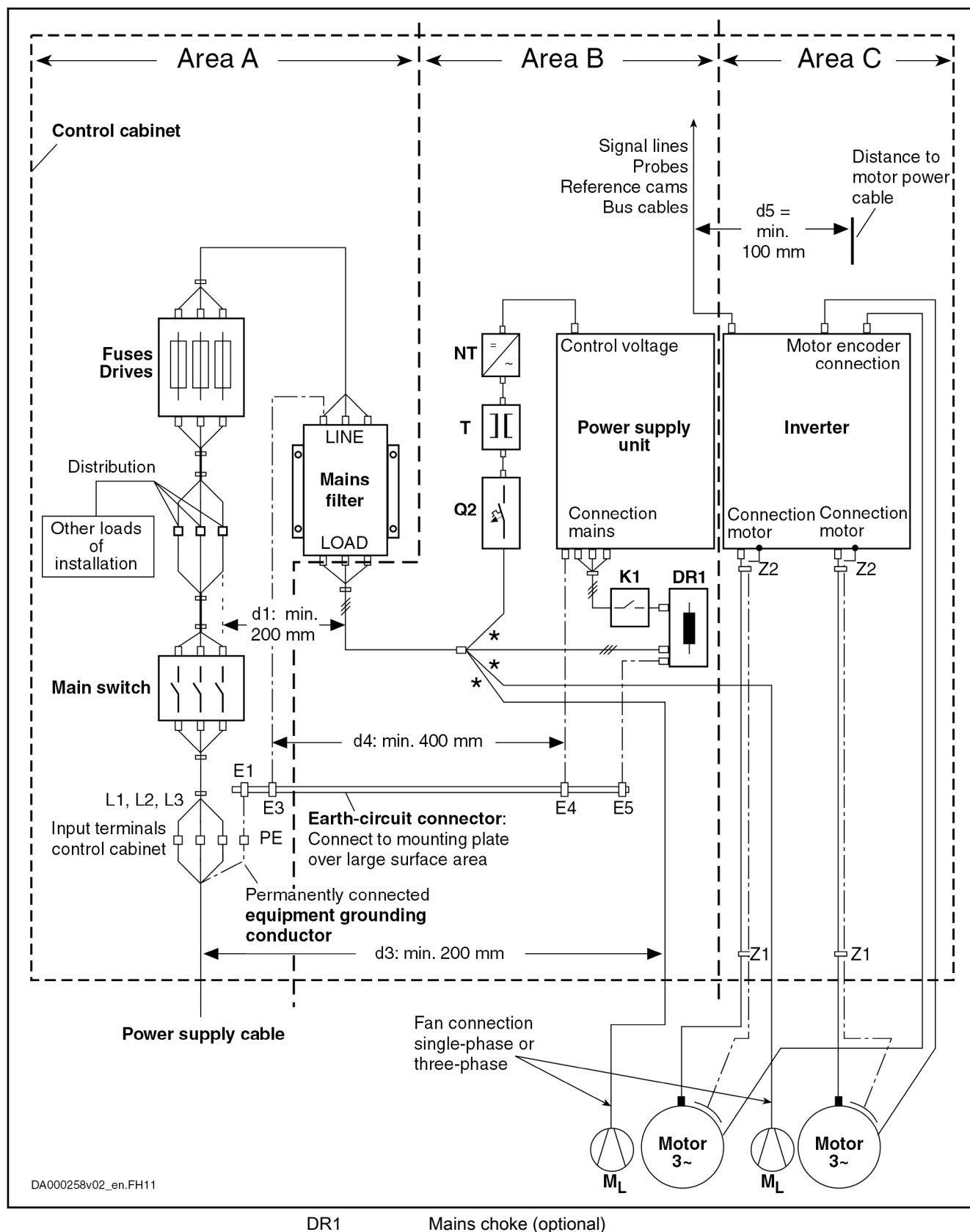
Recommendation for complex systems: Install drive components in one cabinet and the control units in a second, separate cabinet.

Badly grounded control cabinet doors act as antennas. Therefore, connect the control cabinet doors to the cabinet on top, in the middle and on the bottom via short equipment grounding conductors with a cross section of at least 6 mm² or, even better, via grounding straps with the same cross section. Make sure connection points have good contact.

EMC Measures for Design and Installation

6.2.3 Control Cabinet Design According to Interference Areas - Exemplary Arrangements

Infeding Supply Unit or Converter



EMC Measures for Design and Installation

E1...E5	Equipment grounding conductor of the components
K1	External mains contactor for supply units and converters without integrated mains contactor
M _L	Motor fan
NT	Power supply unit
Q2	Fusing
T	Transformer
Z1, Z2	Shield connection points for cables
*	Not allowed at HNF mains filter
<i>Fig. 6-1: Infeeding Supply Unit or Converter – EMC Areas in the Control Cabinet</i>	

6.2.4 Design and Installation in Area A - Interference-Free Area of Control Cabinet

Arranging the Components in the Control Cabinet

Comply with recommended distance of at least **200 mm** (distance d1 in the figure):

- Between components and electrical elements (switches, pushbuttons, fuses, terminal connectors) in the interference-free area A and the components in the two other areas B and C

Comply with recommended distance of at least **400 mm** (distance d4 in the figure):

- Between magnetic components (such as transformers, mains chokes and DC bus chokes that are directly connected to the power connections of the drive system) and the interference-free components and lines between mains and filter including the mains filter in area A

If these distances are not kept, the magnetic leakage fields are injected to the interference-free components and lines connected to the mains and the limit values at the mains connection are exceeded in spite of the installed filter.

Cable Routing of the Interference-Free Lines to the Mains Connection

Comply with recommended distance of at least **200 mm** (distance d1 and d3 in the figure):

- Between supply feeder or lines between filter and exit point from the control cabinet in area A and the lines in area B and C

If this is impossible, there are two alternatives:

- Install lines in shielded form and connect the shield at several points (at least at the beginning and at the end of the line) to the mounting plate or the control cabinet housing over a large surface area.
- Separate lines from the other interference-susceptible lines in areas B and C by means of a grounded distance plate vertically attached to the mounting plate.

Install the shortest possible lines within the control cabinet and install them directly on the grounded metal surface of the mounting plate or of the control cabinet housing.

Mains supply lines from areas B and C must not be connected to the mains without a filter.



In case you do not observe the information on cable routing given in this section, the effect of the mains filter is totally or partly neutralized. This will cause the noise level of the interference emission to be higher within the range of 150 kHz to 40 MHz and the limit values at the connection points of the machine or installation will thereby be exceeded. Consider the specified distances to be recommended data, provided that the dimensions of the control cabinet allow installing the lines accordingly.

EMC Measures for Design and Installation

Routing and Connecting a Neutral Conductor (N)	If a neutral conductor is used together with a three-phase connection, it must not be installed unfiltered in zones B and C, in order to keep interference off the mains.
Motor Fan at Mains Filter	Single-phase or three-phase supply lines of motor fans, that are usually routed in parallel with motor power cables or interference-susceptible lines, must be filtered: • In drive systems with regenerative supply units, via a separate single-phase (NFE type) or three-phase filter (HNF type) near the mains connection of the control cabinet • In drive systems with only infeeding supply units, via the available three-phase filter of the drive system When switching power off, make sure the fan is not switched off. When switching power off, make sure the fan is not switched off.
Loads at Mains Filter of Drive System	 Only operate allowed loads at the mains filter of the drive system! At the three-phase filter for the power connection of regenerative supply units, it is only allowed to operate the following loads: • HMV supply unit with mains choke and, if necessary, mains contactor Do not operate any motor fans, power supply units etc. at the mains filter of the drive system.
Shielding Mains Supply Lines in Control Cabinet	If there is a high degree of interference injection to the mains supply line within the control cabinet, although you have observed the above instructions (to be found out by EMC measurement according to standard), proceed as follows: • Only use shielded lines in area A • Connect shields to the mounting plate at the beginning and the end of the line by means of clips The same procedure may be required for long cables of more than 2 m between the point of power supply connection of the control cabinet and the filter within the control cabinet.
Mains Filters for AC Drives	Ideally mount the mains filter on the parting line between the areas A and B. Make sure the ground connection between filter housing and housing of the drive controllers has good electrically conductive properties. If single-phase loads are connected on the load side of the filter, their current may be a maximum of 10% of the three-phase operating current. A highly imbalanced load of the filter would deteriorate its interference suppression capacity. If the mains voltage is more than 480 V, connect the filter to the output side of the transformer and not to the supply side of the transformer.
Grounding	In the case of bad ground connections in the installation, the distance between the lines to the grounding points E1, E2 in area A and the other grounding points of the drive system should be at least $d_4 = 400 \text{ mm}$, in order to minimize interference injection from ground and ground cables to the power input lines. See also 6.2.2 Division Into Areas (Zones), page 48.
Point of Connection for Equipment Grounding Conductor at Machine, Installation, Control Cabinet	The equipment grounding conductor of the power cable of the machine, installation or control cabinet has to be permanently connected at point PE and have a cross section of at least 10 mm² or to be complemented by a second equipment grounding conductor via separate terminal connectors (according to EN 61800-5-1:2007, section 4.3.5.5.2). If the cross section of the outer

EMC Measures for Design and Installation

conductor is bigger, the cross section of the equipment grounding conductor must be accordingly bigger.

6.2.5 Design and Installation in Area B - Interference-Susceptible Area of Control Cabinet

Arranging Components and Lines	Modules, components and lines in area B should be placed at a distance of at least d1 = 200 mm from modules and lines in area A. Alternative: Shield modules, components and lines in area B by distance plates mounted vertically on the mounting plate from modules and lines in area A or use shielded lines. Only connect power supply units for auxiliary or control voltage connections in the drive system to the mains via a mains filter. See 6.2.2 Division Into Areas (Zones), page 48. Install the shortest possible lines between drive controller and filter.
Control Voltage or Auxiliary Voltage Connection	Only in exceptional cases should you connect power supply unit and fusing for the control voltage connection to phase and neutral conductor. In this case, mount and install these components in area A far away from the areas B and C of the drive system. For details see section 6.2.4 Design and Installation in Area A - Interference-Free Area of Control Cabinet, page 51. Run the connection between control voltage connection of the drive system and power supply unit used through area B over the shortest distance.
Line Routing	Run the lines along grounded metal surfaces, in order to minimize radiation of interference fields to area A (transmitting antenna effect).

6.2.6 Design and Installation in Area C - Strongly Interference-Susceptible Area of Control Cabinet

Influence of the Motor Power Cable	Area C mainly concerns the motor power cables, especially at the connection point at the drive controller. The longer the motor power cable, the greater its leakage capacitance. To comply with a certain EMC limit value, the allowed leakage capacitance of the mains filter is limited. For the calculation of the leakage capacitance, see the documentation on the drive system of the drive controller used.
	 • Run the shortest possible motor power cables. • Only use shielded motor power cables by Rexroth.
Routing the Motor Power Cables and Motor Encoder Cables	Route the motor power cables and motor encoder cables along grounded metal surfaces, both inside the control cabinet and outside of it, in order to minimize radiation of interference fields. If possible, route the motor power cables and motor encoder cables in metal-grounded cable ducts. Route the motor power cables and motor encoder cables • with a distance of at least d5 = 100 mm to interference-free lines, as well as to signal cables and signal lines (alternatively separated by a grounded distance plate) • in separate cable ducts, if possible
Routing the Motor Power Cables and Mains Connection Lines	For converters (drive controllers with individual mains connection), route motor power cables and (unfiltered) mains connection lines in parallel for a maximum distance of 300 mm. After that distance, route motor power cables and power supply cables in opposite directions and preferably in separate cable ducts.

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Ideally, the outlet of the motor power cables at the control cabinet should be provided in a distance of at least $d3 = 200 \text{ mm}$ from the (filtered) power supply cable.

Converter - Routing the Motor Power Cables

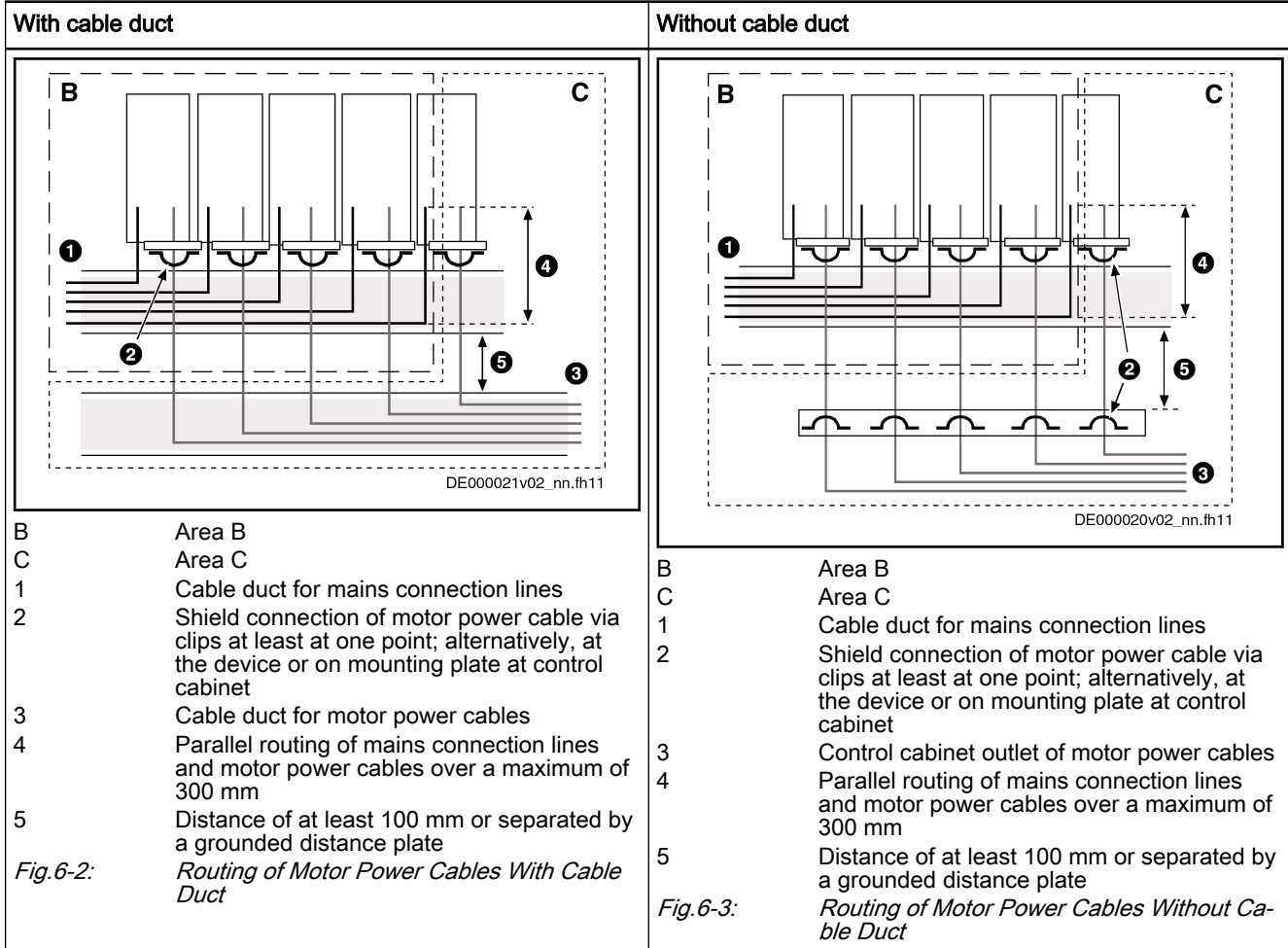


Fig. 6-2:

Routing of Motor Power Cables With Cable Duct

Fig. 6-3:

Routing of Motor Power Cables Without Cable Duct

Fig. 6-4: Routing of Cables for Converter

6.3 Ground Connections

Housing and Mounting Plate

By means of appropriate ground connections, it is possible to avoid the emission of interference, because interference is discharged to ground on the shortest possible way.

Ground connections of the metal housings of EMC-critical components (such as filters, devices of the drive system, connection points of the cable shields, devices with microprocessor and switching power supply units) have to be well contacted over a large surface area. This also applies to all screw connections between mounting plate and control cabinet wall and to the mounting of a ground bus to the mounting plate.

The best solution is to use a zinc-coated mounting plate. Compared to a lacquered plate, the connections in this case have a good long-time stability.

Connection Elements

For lacquered mounting plates, always use screw connections with tooth lock washers and zinc-coated, tinned screws as connection elements. At the connection points, remove the lacquer so that there is safe electrical contact over a large surface area. You achieve contact over a large surface area by

EMC Measures for Design and Installation

means of bare connection surfaces or several connection screws. For screw connections, you can establish the contact to lacquered surfaces by using tooth lock washers.

Metal Surfaces

Always use connection elements (screws, nuts, plain washers) with good electroconductive surface.

Bare zinc-coated or tinned metal surfaces have **good electroconductive properties**.

Anodized, yellow chromitized, black gunmetal finish or lacquered metal surfaces have **bad electroconductive properties**.

Ground Wires and Shield Connections

For connecting ground wires and shield connections, it is not the cross section but the size of contact surface that is important, as the high-frequency interference currents mainly flow on the surface of the conductor.

Always connect cable shields, especially shields of the motor power cables, to ground potential over a large surface area.

6.4 Installing Signal Lines and Signal Cables

Line Routing

For measures to prevent interference, see the Project Planning Manuals of the respective device. In addition, we recommend the following measures:

- Route signal and control lines separately from the power cables with a minimum distance of **d5 = 100 mm** (see [6.2.2 Division Into Areas \(Zones\), page 48](#)) or with a grounded separating sheet. The optimum way is to route them in separate cable ducts. If possible, lead signal lines into the control cabinet at one point only.
- If signal lines are crossing power cables, route them in an angle of 90° in order to avoid interference injection.
- Ground spare cables, that are not used and have been connected, at least at both ends so that they do not have any antenna effect.
- Avoid unnecessary line lengths.
- Run cables as close as possible to grounded metal surfaces (reference potential). The ideal solution are closed, grounded cable ducts or metal pipes which, however, is only obligatory for high requirements (sensitive instrument leads).
- Avoid suspended lines or lines routed along synthetic carriers, because they are functioning like reception antennas (noise immunity) and like transmitting antennas (emission of interference). Exceptional cases are flexible cable tracks over short distances of a maximum of 5 m.

Shielding

Connect the cable shield immediately at the devices in the shortest and most direct possible way and over the largest possible surface area.

Connect the shield of **analog signal lines** at one end over a large surface area, normally in the control cabinet at the analog device. Make sure the connection to ground/housing is short and over a large surface area.

Connect the shield of **digital signal lines** at both ends over a large surface area and in short form. In the case of potential differences between beginning and end of the line, run an additional bonding conductor in parallel. This prevents compensating current from flowing via the shield. The guide value for the cross section is 10 mm².

You absolutely have to equip separable connections with connectors with grounded metal housing.

In the case of non-shielded lines belonging to the same circuit, twist feeder and return cable.

EMC Measures for Design and Installation

6.5 General Measures of Radio Interference Suppression for Relays, Contactors, Switches, Chokes and Inductive Loads

If, in conjunction with electronic devices and components, inductive loads, such as chokes, contactors, relays are switched by contacts or semiconductors, appropriate interference suppression has to be provided for them:

- By arranging free-wheeling diodes in the case of d.c. operation
- In the case of a.c. operation, by arranging usual RC interference suppression elements depending on the contactor type, immediately at the inductance

Only the interference suppression element arranged immediately at the inductance does serve this purpose. Otherwise, the emitted noise level is too high which can affect the function of the electronic system and of the drive.

7 Accessories

7.1 Components for IndraDrive Fc

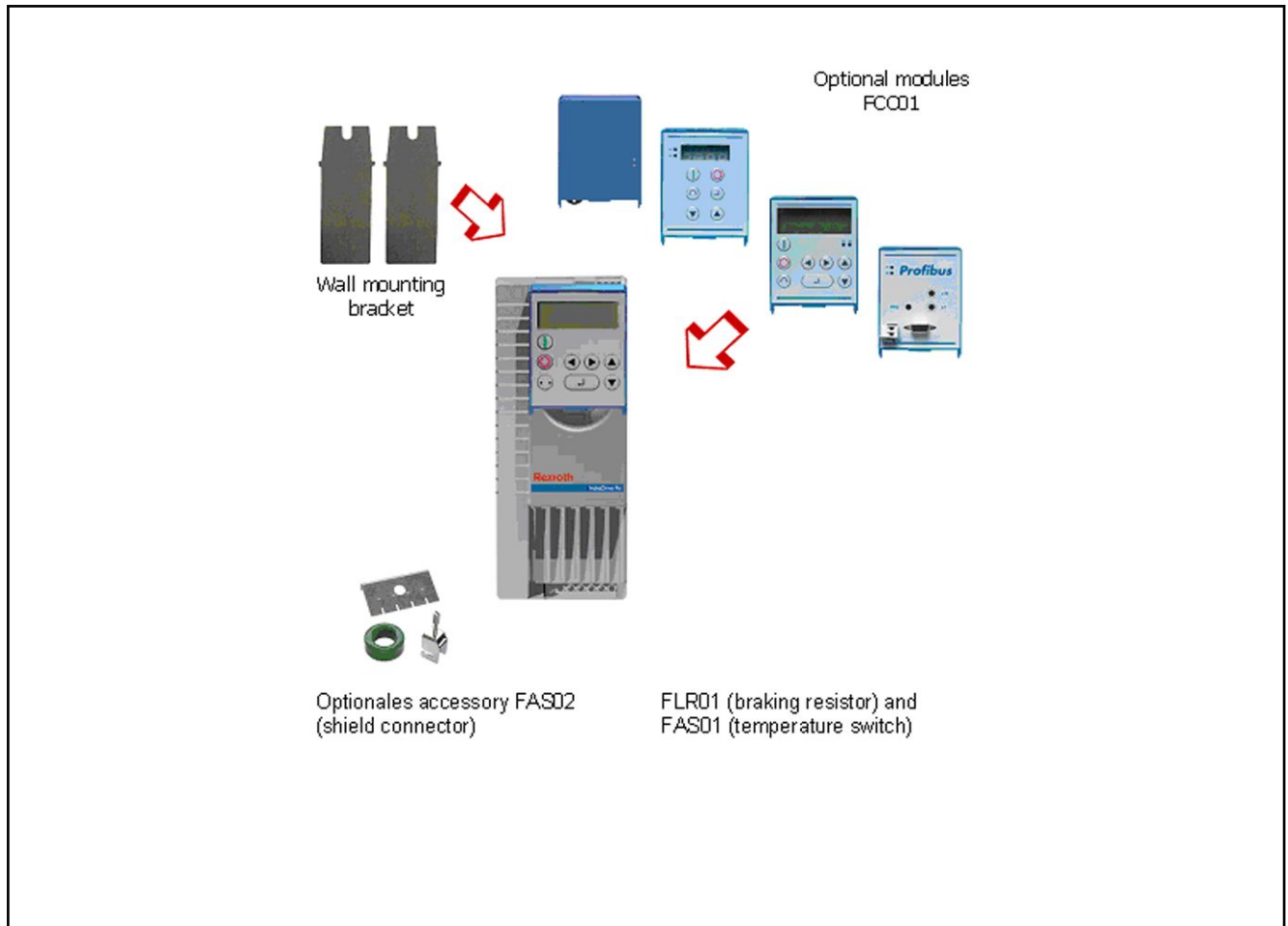


Fig. 7-1: Components for IndraDrive Fc

Available Accessories

- Braking resistor FLR01: For applications with energy recovery function
- Temperature switch FAS01: For assembly to FLR01 braking resistors
- Additional component FAS02: To connect the motor cable shield to the housing of the frequency converter
- DriveTop Fc software: For parameterization and commissioning
- Any other accessories on request

Accessories

7.2 Type Code FCC01 Function Module

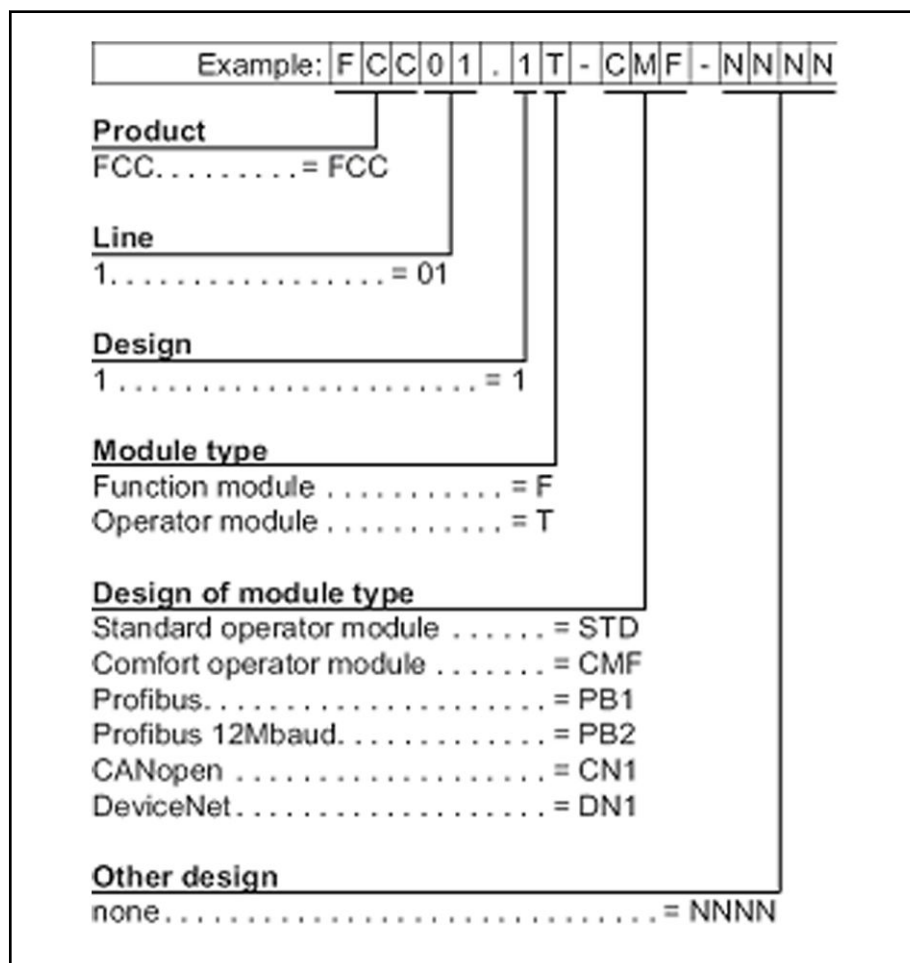


Fig. 7-2: Type Code FCS01

7.3 Type Code FLR01 Braking Resistor

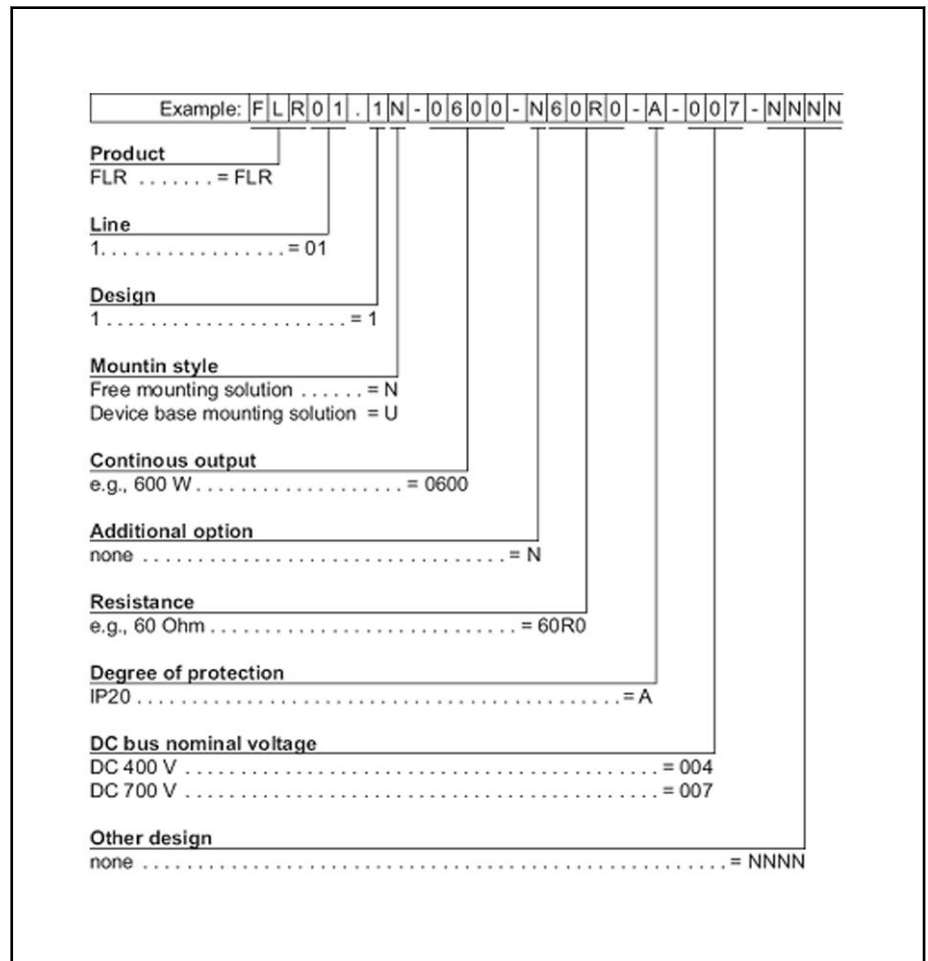


Fig.7-3: Type Code FLR01

When a three-phase a.c. motor is braked (when its frequency is reduced), electrical energy is regenerated to the frequency converter. To prevent over-voltage cut-off of the frequency converter, an external braking resistor can be used. In this process, the integrated power transistor (brake chopper) discharges the DC bus voltage (switching limit at approx. DC420V or DC720V, depending on type of FCS01) to the braking resistor. Here, the recovered energy is converted to heat.

Accessories

7.4 Accessories FAS01 Type Code (Temperature Switch)

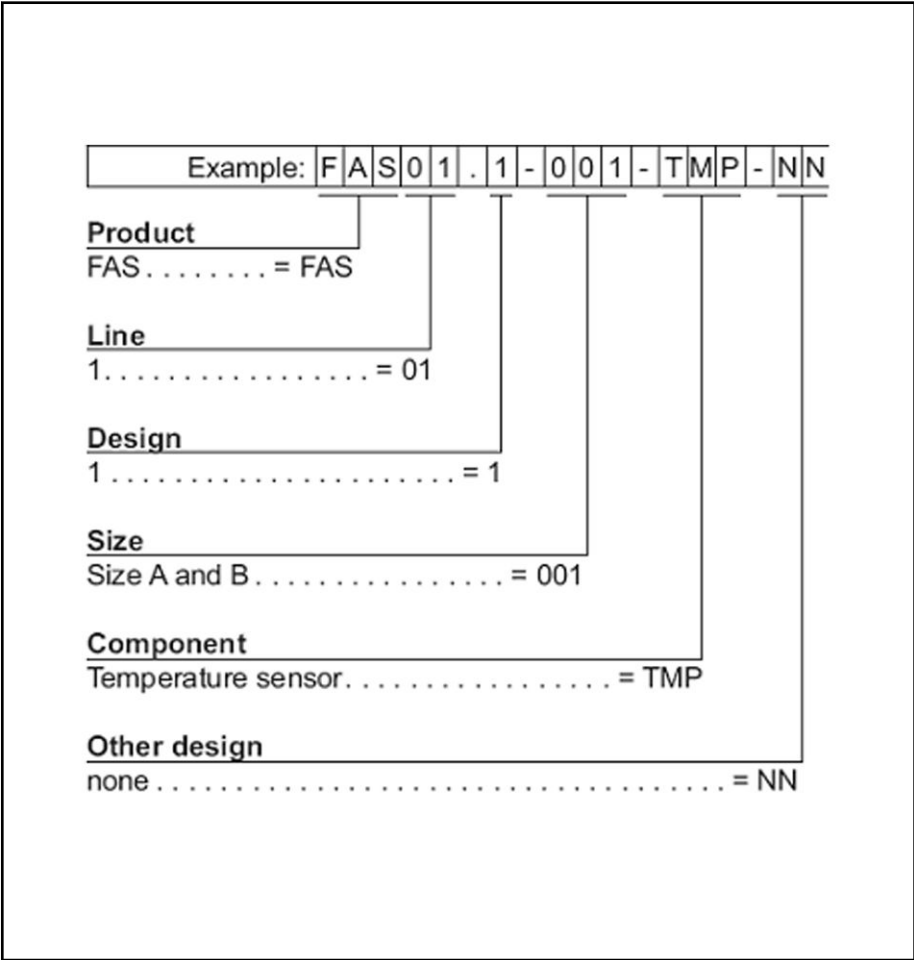


Fig. 7-4: Type Code FAS01

FCS01 with Power of up to 2.2kW

With a converter power of up to 2.2 kW, standard substructure resistors **FLR01.1U** can be used. The resistor can additionally be equipped with an optional temperature switch **FAS01** to prevent overloading. The fixing material in the groove on the side is contained in the scope of supply of FLR01.1N. The braking resistor and the temperature switch are connected via lines.

7.5 Accessories FAS02 Type Code (Shield Connection)

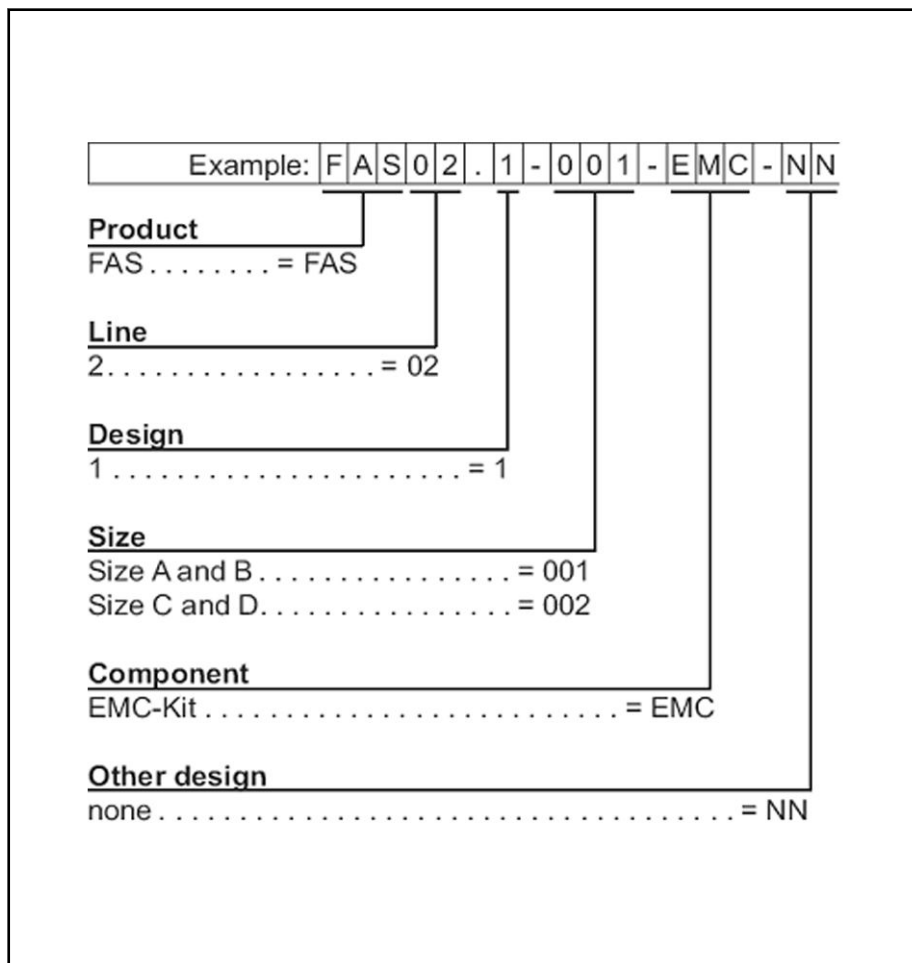


Fig.7-5: Type Code FAS02

8 Service and Support

Our worldwide service network provides an optimized and efficient support. Our experts offer you advice and assistance should you have any queries. You can contact us **24/7**.

Service Germany

Our technology-oriented Competence Center in Lohr, Germany, is responsible for all your service-related queries for electric drive and controls.

Contact the **Service Helpdesk & Hotline** under:

Phone:	+49 9352 40 5060
Fax:	+49 9352 18 4941
E-mail:	service.svc@boschrexroth.de
Internet:	http://www.boschrexroth.com

Additional information on service, repair (e.g. delivery addresses) and training can be found on our internet sites.

Service worldwide

Outside Germany, please contact your local service office first. For hotline numbers, refer to the sales office addresses on the internet.

Preparing information

To be able to help you more quickly and efficiently, please have the following information ready:

- Detailed description of malfunction and circumstances resulting in the malfunction
- Type plate name of the affected products, in particular type codes and serial numbers
- Your contact data (phone and fax number as well as your email address)

9 Environmental Protection and Disposal

9.1 Environmental Protection

Production Processes	The products are made with energy- and resource-optimized production processes which allow re-using and recycling the resulting waste. We regularly try to replace pollutant-loaded raw materials and supplies by more environment-friendly alternatives.														
No Release of Hazardous Substances	Our products do not contain any hazardous substances which may be released in the case of appropriate use. Normally, our products will not have any negativ influences on the environment.														
Significant Components	Basically, our products contain the following components: <table> <tr> <td>Electronic devices</td><td>Motors</td></tr> <tr> <td>• steel</td><td>• steel</td></tr> <tr> <td>• aluminum</td><td>• aluminum</td></tr> <tr> <td>• copper</td><td>• copper</td></tr> <tr> <td>• synthetic materials</td><td>• brass</td></tr> <tr> <td>• electronic components and modules</td><td>• magnetic materials</td></tr> <tr> <td></td><td>• electronic components and modules</td></tr> </table>	Electronic devices	Motors	• steel	• steel	• aluminum	• aluminum	• copper	• copper	• synthetic materials	• brass	• electronic components and modules	• magnetic materials		• electronic components and modules
Electronic devices	Motors														
• steel	• steel														
• aluminum	• aluminum														
• copper	• copper														
• synthetic materials	• brass														
• electronic components and modules	• magnetic materials														
	• electronic components and modules														

9.2 Disposal

Return of Products	Our products can be returned to our premises free of charge for disposal. It is a precondition, however, that the products are free of oil, grease or other dirt. Furthermore, the products returned for disposal must not contain any undue foreign material or foreign components. Send the products "free domicile" to the following address: Bosch Rexroth AG Electric Drives and Controls Buergermeister-Dr.-Nebel-Strasse 2 97816 Lohr am Main, Germany
Packaging	The packaging materials consist of cardboard, wood and polystyrene. These materials can be recycled anywhere without any problem. For ecological reasons, please refrain from returning the empty packages to us.
Batteries and Accumulators	Batteries and accumulators can be labeled with this symbol.  The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin. The end user within the EU is legally obligated to return used batteries. Outside the validity of the EU Directive 2006/66/EC keep the stipulated directives. Used batteries can contain hazardous substances, which can harm the environment or the people's health when they are improper stored or disposed of. After use, the batteries or accumulators contained in Rexroth products have to be properly disposed of according to the country-specific collection.
Recycling	Most of the products can be recycled due to their high content of metal. In order to recycle the metal in the best possible way, the products must be disassembled into individual modules.

Environmental Protection and Disposal

Metals contained in electric and electronic modules can also be recycled by means of special separation processes.

Products made of plastics can contain flame retardants. These plastic parts are labeled according to EN ISO 1043. They have to be recycled separately or disposed of according to the valid legal requirements.

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