

MULTICUT 08

08/2 ME 08/2 M 08/26 M 08/2 M, EX
08/2 MES 08/2 MS 08/26 MS

MULTICUT 20

20/2 M PLUS 20/2 M PLUS, EX

**DE Original-
Betriebsanleitung**

EN Instruction Manual
FR Instructions de service
NL Gebruikshandleiding
PT Instruções de serviço
IT Istruzioni per l'uso

DA Driftsvejledning
SV Bruksanvisning
FI Käyttöohje
PL Instrukcja eksploatacji
CS Návod pro provoz
SK Návod na prevádzku
HU Üzemeltetési útmutató
RO Manual de utilizare
RU Руководство по эксплуатации



You have purchased a product made by Pentair Jung Pumpen and with it, therefore, also excellent quality and service. Secure this service by carrying out the installation works in accordance with the instructions, so that our product can perform its task to your complete satisfaction. Please remember that damage caused by incorrect installation or handling will adversely affect the guarantee. Therefore please adhere to the instructions in this manual!

This appliance can be used by children aged 8 years or over and by persons with limited physical, sensory or intellectual capabilities, or with limited experience and knowledge, provided that they are supervised or have been instructed in the safe use of the appliance and are aware of the dangers involved. Children must not be allowed to play with the appliance. Cleaning and user maintenance must not be carried out by children unless they are supervised.

Damage prevention in case of failure

Like any other electrical device, this product may fail due to a lack of mains voltage or a technical defect.

If damage (including consequential damage) can occur as a result of product failure, the following precautions can be taken at your discretion:

- Installation of a water level dependent (under circumstances, mains-independent) alarm system, so that the alarm can be heard before damage occurs.
- Inspection of the collecting tank/chamber for tightness up to the top edge before – or at the latest, during – installation or operation of the product.
- Installation of backflow protection for drainage units that can be damaged by wastewater leakage upon product failure.
- Installation of a further product that can compensate in case of failure of the other product (e.g. duplex unit).
- Installation of an emergency power generator.

As these precautions serve to prevent or minimise consequential damage upon product failure, they are to be strictly observed as the manufacturer's guideline – in line with the standard DIN EN specifications as state of the art – when using the product (Higher Regional Court Frankfurt/Main, Ref.: 2 U 205/11, 06/15/2012).

SAFETY INSTRUCTIONS

This instruction manual contains essential information that must be observed during installation, operation and servicing. It is therefore important that the installer and the responsible technician/operator read this instruction manual before the equipment is installed and put into operation. The manual must always be available at the location where the pump or the plant is installed.

Failure to observe the safety instructions can lead to the loss of all indemnity.

In this instruction manual, safety information is distinctly labelled with particular symbols. Disregarding this information can be dangerous.



General danger to people



Warning of electrical voltage

NOTICE! Danger to equipment and operation

Qualification and training of personnel

All personnel involved with the operation, servicing, inspection and installation of the equipment must be suitably qualified for this work and must have studied the instruction manual in depth to ensure that they are sufficiently conversant with its contents. The supervision, competence and areas of responsibility of the personnel must be precisely regulated by the operator. If the personnel do not have the necessary skills, they must be instructed and trained accordingly.

Safety-conscious working

The safety instructions in this instruction manual, the existing national regulations regarding accident prevention, and any internal working, operating and safety regulations must be adhered to.

Safety instructions for the operator/user

All legal regulations, local directives and safety regulations must be adhered to.

The possibility of danger due to electrical energy must be prevented.

Leakages of dangerous (e.g. explosive, toxic, hot) substances must be discharged such that no danger to people or the environment occurs. Legal regulations must be observed.

Safety instructions for installation, inspection and maintenance works

As a basic principle, works may only be carried out to the equipment when it is shut down. Pumps or plant that convey harmful substances must be decontaminated.

All safety and protection components must be re-fitted and/or made operational immediately after the works have been completed. Their effectiveness must be checked before restarting, taking into account the current regulations and stipulations.

Unauthorised modifications, manufacture of spare parts

The equipment may only be modified or altered in agreement with the manufacturer. The use of original spare parts and accessories approved by the manufacturer is important for safety reasons. The use of other parts can result in liability for consequential damage being rescinded.

Unauthorised operating methods

The operational safety of the supplied equipment is only guaranteed if the equipment is used for its intended purpose. The limiting values given in the "Technical Data" section may not be exceeded under any circumstances.

Instructions regarding accident prevention

Before commencing servicing or maintenance works, cordon off the working area and check that the lifting gear is in perfect condition.

Never work alone. Always wear a hard hat, safety glasses and safety shoes and, if necessary, a suitable safety belt.

Before carrying out welding works or using electrical devices, check to ensure there is no danger of explosion.

People working in wastewater systems must be vaccinated against the pathogens that may be found there. For the sake of your health, be sure to pay meticulous attention to cleanliness wherever you are working.

Make sure that there are no toxic gases in the working area.

Observe the health and safety at work regulations and make sure that a first-aid kit is to hand.

In some cases, the pump and the pumping medium may be hot and could cause burns.

For installations in areas subject to explosion hazards, special regulations apply!

AREAS OF APPLICATION

Submersible pumps in the MultiCut range are suitable for effluent in pressure drainage systems or for the drainage of single dwellings.

MultiCut pumps are principally used for:

- effluent containing fibrous matter
- effluent containing solids (without stones)
- domestic effluent without faecal matter
- domestic effluent with faecal matter
- mechanically cleaned effluent

The submersible pumps are supplied without explosion protection or with explosion protection.

When using the pumps, the relevant national laws, regulations and stipulations must be adhered to, for example:

- Installation of lowvoltage systems (e.g., VDE 0100 in Germany)
- Safety and working materials (e.g., BetrSichV and BGR 500 in Germany)
- Safety in wastewater systems (e.g., GUV-V C5, GUV-R104, GUV-R126 in Germany)
- Electrical systems and operating resources (e.g., GUV-VA3 in Germany)
- Explosion protection EN 60079-0, EN 60079-1 and EN 1127-1.

For non-standard utilisation conditions in areas subject to explosion hazards, please ask the local authority responsible.

In Germany, this would be, for example, the Trade Supervisory Centre (Gewerbeaufsicht), the Technical Inspection Agency (TÜV), the building authority (Bauamt) or professional organisation (Berufsgenossenschaft).

The installation and operation of this equipment is regulated by the ordinance concerning the protection of health and safety in the provision of work equipment and its use at work, concerning safety when operating installations subject to monitoring, and concerning the organisation of industrial health and safety at work, (Betriebssicherheitsverordnung), Article 1.

Where no explosion protection is stipulated for the pumping of foul wastewater at the installation location, pumps without explosion protection may also be used.

Modes of operation

with the pumped medium at a temperature of 40°C:

Motor submersed: continuous operation S1

Motor emerged: short duration operation S2;

see "Technical Data"

Motor emerged: intermittent operation S3;

see "Technical Data"

The submersible pump is frost-resistant down to -20°C when stored in dry conditions. When installed, however, it must not

be allowed to freeze in the water.

Transport

The pump must always be lifted by the handle and never by the power supply cable! The pump should only be lowered by using a rope or chain.

ELECTRICAL CONNECTION

By using our controls, you can be sure that the requirements of the EU type-testing certificate are met.

NOTICE! Only qualified electricians may carry out electrical works to the pump or the controls.

The standards applicable in each case (e.g. EN), the country-specific regulations (e.g. VDE in Germany), and the regulations of the local supply network operator must be observed.

NOTICE! Never lay the end of cables in water! Penetrating water may cause malfunctions.

Only slow-blow fuses or automatic fuses with C or D characteristics are to be used as pre-fuses for the pump. Necessary fuse protection at least 10 A.

The 3-phase-pumps must be protected via an overload trip. Setting = nominal current.

If the protective device has been triggered, the cause of the malfunction must be eliminated before switching on again.

Coil thermostats

NOTICE! In addition to the overload trip or protective switch of the motor, the thermostats integrated in the motor winding must also be connected. The thermostats are suitable for 250 V / 1.2 A (cos phi = 0.6) and are labelled 30 and 32 for connection purposes.

For this reason, after the protective device has been triggered, the mains cable must be unplugged before remedying the cause of the failure, as otherwise the pump will be automatically switched on again.

Thermostat connection without explosion protection

The thermostats are to be connected in such a way that the motor is switched off via the control circuit when the response temperature is reached. The motor is switched on again automatically after the winding has cooled down.

Thermostat connection with explosion protection

The thermostats are to be connected in such a way that the motor is switched off via the control circuit when the response temperature is reached. It must not be possible for the motor to switch on again automatically after the winding has cooled down.

WARNING!

After an automatic cut-out via the temperature limiters, the cause of the malfunction must first be eliminated. Only then may the motor be switched on again manually.

The restart interlock must be "non-resetting on power failure", i.e. the lock must be in place to prevent restarting even after a power cut (in Europe: Directive 2014/34/EU, Appendix II 1.5, EN 60079-17 Table1, B8).

Operation with frequency converter

Frequency converters may only be used for controlling the frequency of special models of three-phase pumps. For hydraulic reasons we do not recommend operation below 30 Hz.

Alternating current pumps are unsuitable as a rule.

NOTICE! For physical reasons, pumps may not be operated at a higher frequency than that shown on the type plate. If the frequency increases beyond the value on the type plate, the power input increases and the motor is then overloaded.

For special models of three-phase pumps that are designed for frequency converter operation, the motor type shown on the type plate is labelled with an additional "K" (e.g. D90-2/75 CK). These pumps also have a sticker on the end of the cable that indicates their suitability for use with a frequency converter.

These motors are fitted with PTC thermistors as winding protectors. Voltages of more than 2.5 V may not be connected to the winding protection terminals 40 and 41! For explosion protected pumps, a type-tested tripping unit that complies with the EU type-testing requirements is also necessary.

Rotational direction

Not applicable for alternating current pumps. The rotational direction must be checked before installation! If the rotational direction is correct, the start-up jolt should be in the opposite direction to the rotational direction arrow on the motor housing. The wrong rotational direction is also indicated if the pump performs inadequately when installed, or if loud noises can be heard during operation. If the rotational direction is wrong, 2 phases of the supply cable must be swapped over.

CAUTION!

The start-up jolt can be very forceful.

Potential equalisation

To comply with EN 60079-14 and EN 1127-1, an additional equipotential bonding must be installed for facilities with protective earth conductors in TN/TT networks in areas subject to explosion hazards. In Germany, for example, the design must be in accordance with VDE 0100, Part 540 (Association of German Electrical Engineers).

No additional potential equalisation is required on site for Pentair Jung Pumpen concrete or plastic chambers in explosion zones 1 and 2 (statement made by TÜV Nord (Technical Inspection Agency) in March 2008).

Exception: if conductive parts, such as cable protection sleeves made of corrugated pipe or a pressure pipe made of metal, are connected to the chamber from the outside. In this case, an electrically conductive connection must be made between the conductive parts and the housing of the pump(s). For corrosion protection reasons, the connection should be made using stainless steel.

Explosion protected pumps have a special connection point at the cable entry point.

INSTALLATION

The pump must be installed as shown in the examples. For installations in accordance with DIN EN 12056-2, the pressure pipe must be laid in a loop above the local back pressure level

and protected with a back pressure valve.

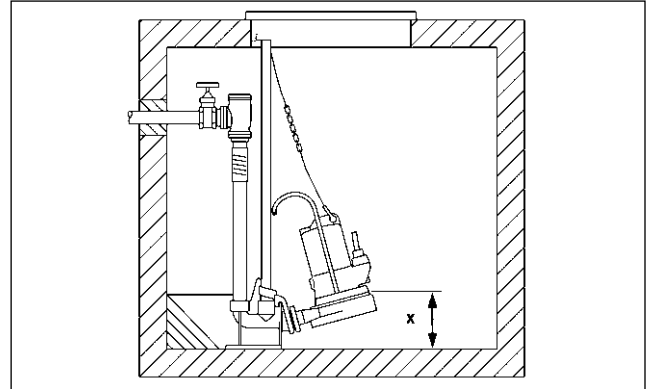
Dimensions of chamber

Single installation with pump base: 40 x 40 cm

Single installation with guide rail system: 40 x 65 cm

Duplex installation: 85 x 65 cm

Example installation with guide rail system



Assembly: Fix the coupling base firmly to the floor of the collection chamber using plugs and then mount the guide rails. Next, install the pressure pipe including the necessary fittings, such as the non-return valve and shut-off valves.

Finally, fit the pump with the screwed-on coupling catch on to the guide rails and lower it into place using a chain fixed to the shackle.

A fixing facility for lifting gear should be provided above the chamber opening at a sufficient height.

Level monitoring can be carried out using various systems. Their specific characteristics and requirements can be found in the relevant operating manuals.

WARNING!

In accordance with the explosion protection laws and regulations, JUNG Ex-pumps should never be allowed to run dry or to operate in "snore" mode.

The pump must switch off when the water level sinks to the upper edge of the pump housing (x in the illustration), at the very latest. This shut-down must be implemented via a separate switching circuit. Dry running for servicing or inspection purposes may only take place outside the potentially explosive area.

A correspondingly larger diameter pipe should be used for longer pressure pipelines to avoid pipe friction losses.

Rising pressure pipes must be protected from frost! A chamber cover must be selected that is suitable for the intended use and has the required load-bearing capacity.

If the pump is malfunctioning, part of the contents of the oil reservoir could escape into the pumping medium.

Not Ex-pumps. If a hose is used as a pressure line, care must be taken to ensure that for every pumping operation the hose is completely empty before the pump is submersed. Any residual liquid would obstruct the ventilation of the pump housing and therefore also hinder the pumping operation.

This situation can also occur if the pump runs dry, pumps down to a lower level than that shown in the installation drawing, or runs in "snore" mode during the daily test run.

SERVICING

Maintenance and inspection of this product must be carried out in accordance with EN 12056-4 and EN 60079-14. To ensure continued reliability of service, we recommend that you take out a service contract.

WARNING!

Before carrying out any works: disconnect the pump and the controls from the mains and take steps to ensure that it cannot be energized again.

WARNING!

Check the mains cable for signs of mechanical and chemical damage. Damaged or kinked cables must be replaced by the manufacturer.

NOTICE! When using a chain to lift the pump, please observe the relevant national regulations regarding accident prevention. Lifting gear must be checked regularly by an expert in accordance with the legal regulations.

NOTICE! Motors in the EX range conform to the "flameproof enclosures" ignition protection category. Maintenance works that affect the explosion protection may only be carried out by authorised specialists or by the manufacturer. When carrying out repairs, all areas next to flameproof gaps must be checked for damages and, if necessary, replaced genuine parts.

Oil check

The oil reservoir is sealed on the outside with a sealing screw. In order to check the mechanical seal, the oil, including any residue, must be drained from the oil reservoir and collected in a clean measuring container.

- If the oil is contaminated with water (milky), an oil change must be carried out. Check again after a further 300 operating hours, but at the very latest after 6 months!
- However, if the oil is contaminated with both water and pollutants, then not only the oil must be replaced, but the mechanical seal as well.

For monitoring the oil reservoir, it is also possible to retrofit the electrode of our "DKG" or DKG-Ex" seal leak control device in place of the "DKG" sealing screw.

Changing the oil

To ensure operational liability, the first oil change should be carried out after 300 operating hours, with further oil changes carried out after every 1000 operating hours.

If the number of operating hours is very low, an oil change should still be carried out at least once a year.

If wastewater with strongly abrasive constituents is being pumped, the oil changes should be carried out at correspondingly shorter intervals.

Use HLP hydraulic mineral oil, viscosity class 22 to 46, e.g. Mobil DTE 22, DTE 24, DTE 25, to replace the oil in the oil reservoir.

The volume of oil required is 350 cm³ for the MultiCut 08/2 M and 300 cm³ for the MultiCut 08/2 M Ex, 20/2 M and 20/2 M Ex.

NOTICE! The oil reservoir may only be filled with the specified quantity of oil. Overfilling will result in the pump being rendered inoperable.

Checking the pump unit

The housing screws for the pump, and the connecting and fixing screws of the installation must be checked to ensure they are fixed securely. They should be tightened if necessary.

If the pump performance decreases, or if increasingly loud noises can be heard during operation, or if the cutting performance decreases (the pump tends to become blocked), the impeller and cutting system must be checked for wear by an expert and replaced if necessary.

Replace the wear plate / Replace the impeller

CAUTION!

Worn impellers can have sharp edges.

1. Block the cutting rotor with a piece of wood and unscrew the central hexagon socket screw



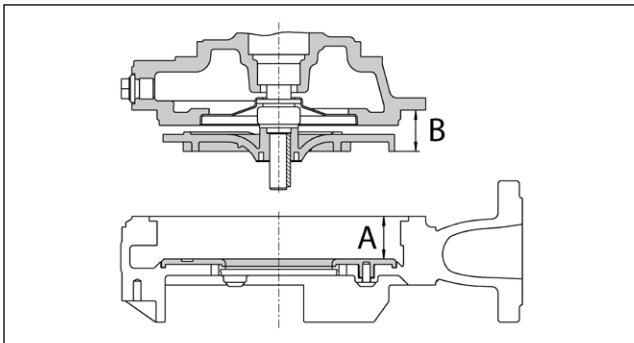
2. Remove the compression piece and screw the extraction tool (code no. JP50325) into the thread of the cutting rotor. Tightening the inner screw pulls the cutting rotor off the pump shaft.



3. Unscrew the four hexagon socket screws on the top of the spiral housing, and take off the spiral housing.
4. **Wear plate:** Remove the old wear plate, clean the housing carefully and insert the new wear plate, making sure it is

fitted level (MA=2.5 Nm).

Impeller: Fit the new impeller with the feather key onto the shaft, using the same number of adjusting washers as before.

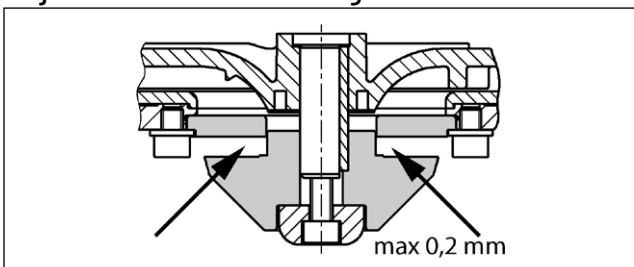


5. Measure dimension B on each blade and note the largest measurement.
6. Measure dimension A in several places and note the smallest measurement.
7. **Notice!** The impeller gap A-B must measure:
 ...08/2M = 0,5-0,7 mm, ...20/2M = 0,8-1,0 mm.
 If the gap is larger or smaller, use adjusting washers (12x16x0.2) under the impeller to adjust the gap.
8. Screw the spiral housing and the oil reservoir/motor back together again.
9. As a final step, put the cutting rotor back on and adjust the cutting gap.

Checking the cutting clearance

Using a suitable tool, e.g. feeler gauge, the cutting clearance between the cutting rotor and the cutting plate can be measured. A cutting clearance of over 0.2 mm must be reduced.

Adjustment of the cutting clearance



1. Block the cutting rotor with a piece of wood and unscrew the central hexagon socket screw.
2. Remove the compression piece and screw the extraction tool (code no. JP50325) into the thread of the cutting rotor. Tightening the inner screw pulls the cutting rotor off the pump shaft.
3. Remove the cutting rotor and one adjusting washer; remove the extraction tool and then reinstall the compression piece and cutting rotor.
4. Block the cutting rotor and tighten again with the hexagon socket screw (tightening torque 8 Nm).
5. Check the freedom of movement of the cutting rotor and the cutting clearance again (max. 0.2 mm).

If the cutting clearance is still too big, a further adjusting washer must be removed. Steps 1-4 must be repeated.

Cleaning

CAUTION!

Worn impellers can have sharp edges.

To clean the impeller and the spiral housing first of all remove the compression piece and the cutting rotor as described above. Then unscrew the 4 hexagon socket screws and remove the spiral housing.

The impeller and the spiral housing can now be cleaned. After this fit the individual components again and adjust the cutting clearance.

To clean the pump chamber a flushing pipe can be fitted as and when required. Type I-M is screwed into place immediately in front of the flange of pump 08/2 M. With the MultiCut 20/2 M, the "Luft" (Air) sealing screw is removed and the Type 0 flushing pipe is screwed in.

Notice! If the wrong screws are unscrewed, the oil will run out of the oil reservoir.

Tightening torque M_A for A2 screw materials

for plastic screw TorxPlus® 25 IP 5x12	$M_A = 2,5 \text{ Nm}$
for M 6	$M_A = 8 \text{ Nm}$
for M 8	$M_A = 20 \text{ Nm}$
for M 10	$M_A = 40 \text{ Nm}$
for M 12	$M_A = 70 \text{ Nm}$
for M 16	$M_A = 160 \text{ Nm}$

WHAT TO DO IN THE EVENT OF ANY PROBLEMS

Pump does not work

- Check mains current (do not use a pin gauge)
- Fuse faulty = may be too weak (please refer to Electrical Connection)
- Mains supply cable damaged = repair to be carried out by manufacturer only

Pump runs but does not pump

- Empty pressure pipe or hose to allow the non-return valve to open and let the air escape from the spiral housing.

Cutting system blocked

- Check the cutting system and readjust or replace as necessary.

Impeller blocked

- Clean spiral housing and impeller.

Decreased pumping performance

- The impeller is worn out = replace it
- Wrong direction of rotation = change 2 phases of the power supply

EU-Konformitätserklärung
EU-Prohlášení o shodě
EU-Overensstemmelseserklæring
EU-Declaration of Conformity
EU-Vaatimustenmukaisuusvakuutus

EU-Déclaration de Conformité
EU-Megfelelőségi nyilatkozat
EU-Dichiarazione di conformità
EU-Conformiteitsverklaring
EU-Deklaracja zgodności

EU-Declaração de Conformidade
EU-Declarație de conformitate
EU-Vyhlasenie o zhode
EU-Försäkran om överensstämmelse

DE - Richtlinien - Harmonisierte Normen
CS - Směrnice - Harmonizované normy
DA - Direktiv - Harmoniseret standard
EN - Directives - Harmonised standards
FI - Direktiivi - Yhdenmukaistettu standardi

FR - Directives - Normes harmonisées
HU - Irányelve - Harmonizált szabványok
IT - Direttive - Norme armonizzate
NL - Richtlijnen - Geharmoniseerde normen
PL - Dyrektywy - Normy zharmonizowane

PT - Directiva - Normas harmonizadas
RO - Directivă - Norme coroborate
SK - Smernice - Harmonizované normy
SV - Direktiv - Harmoniserade normer

• **2006/42/EG** (MD)
• **2011/65/EU** (RoHS)
• **2014/30/EU** (EMC)

EN 809:1998/AC:2010, EN ISO 12100:2010
60034-1: 2010/AC: 2010, EN 61000-3-2:2014, EN 61000-3-3:2013

JUNG PUMPEN GmbH - Industriestr. 4-6 - 33803 Steinhagen - Germany - www.jung-pumpen.de

DE - Wir erklären in alleiniger Verantwortung, dass das Produkt den aufgeführten Richtlinien entspricht.
CS - Prohlašujeme na svou výlučnou odpovědnost, že výrobek odpovídá jmenovaným směrnícím.
DA - Vi erklærer under ansvar at produktet i overensstemmelse med de retningslinjer
EN - We hereby declare, under our sole responsibility, that the product is in accordance with the specified Directives.
FI - Me vakuutamme omalla vastuullamme, että tuote täyttää ohjeita.
FR - Nous déclarons sous notre propre responsabilité que le produit répond aux directives.
HU - Kizárólagos felelősségünk tudatában kijelentjük, hogy ez a termék megfelel az Európai Unió fentnevezett irányelveinek.
IT - Noi dichiariamo sotto la nostra esclusiva responsabilità che il prodotto è conforme alle direttive citate
NL - Wij verklaren geheel onder eigen verantwoordelijkheid dat het product voldoet aan de gestelde richtlijnen.
PL - Z pełną odpowiedzialnością oświadczamy, że produkt odpowiada postanowieniom wymienionych dyrektyw.
PT - Declaramos, sob nossa exclusiva responsabilidade, que o produto está em conformidade com as Diretivas especificadas.
RO - Declaram pe proprie răspundere că produsul corespunde normelor prevăzute de directivele mai sus menționate.
SK - Na výlučnú zodpovednosť vyhlasujeme, že výrobok spĺňa požiadavky uvedených smerníc.
SV - Vi försäkrar att produkten på vårt ansvar är utförd enligt gällande riktlinjer.

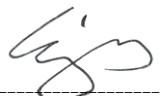
08/2 ME (JP50342)
08/2 MES (JP50343)
08/2 M (JP50344)
08/2 MS (JP50345)
20/2 M PLUS (JP50350)
20/2 M PLUS OV (JP50351)


DE-Weitere normative Dokumente CS-Jinyími normativními dokumenty DA-Andre normative dokumenter EN-Other normative documents FI-Muiden normien FR-Autres documents normatifs HU-Egyéb szabályozó dokumentumokban leírtaknak IT-Altri documenti normativi NL-Verdere normatieve documenten PL-Innymi dokumentami normatywnymi PT-Outros documentos normativos RO-Alte acte normative SK-Iným záväzným dokumentom SV-Vidare normerande dokument
EN 60034-5:2001/A1:2007

DE-Bevollmächtigter für technische Dokumentation CS-Oprávněná osoba pro technickou dokumentaci DA-utoriseret person for teknisk dokumentation EN-Authorized person for technical documentation FI-Valtuutettu henkilö tekninen dokumentaatio FR-Personne autorisée à la documentation technique HU-Hivatalos személy műszaki dokumentáció IT-Persona abilitata per la documentazione tecnica NL-Bevoegd persoon voor technische documentatie PL-Pełnomocnik ds. dokumentacji technicznej PT-Pessoa autorizada para documentação técnica RO-Persoană autorizată pentru documentație tehnică SK-Oprávněná osoba pro technickou dokumentáciu SV-Auktoriserad person för teknisk dokumentation:

JUNG PUMPEN - Stefan Sirges - Industriestr. 4-6 - 33803 Steinhagen

Steinhagen, 05-01-2022


Stefan Sirges, General Manager


i.V. Pascal Köllebeck, Sales Manager



UKCA-Declaration of Conformity

Legislation - Designated Standards

- **Supply of Machinery (Safety) Regulations 2008 (MD)** EN 809:1998/AC:2010, EN ISO 12100:2010
- **The Restriction of the Use of Certain Hazardous Substance in Electrical and Electronic Equipment Regulations 2012 (RoHS)**
- **Electromagnetic Compatibility Regulations 2016 (EMC)** 60034-1AC:2010, EN 61000-3-2:2014, EN 61000-3-3:2013

Name and address of the manufacturer: JUNG PUMPEN GmbH - Industriestr. 4-6 - 33803 Steinhagen - Germany - www.jung-pumpen.de

We hereby declare, under our sole responsibility, that the product is in accordance with the specified Legislation.

08/2 ME (JP50682)

08/2 MES (JP50683)

08/2 M (JP50344)

08/2 MS (JP50345)

20/2 M PLUS (JP50350)

20/2 M PLUS OV (JP50351)

Other normative documents:

EN 60034-5:2001/A1:2007

Authorized person for technical documentation

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Steinhagen, 01-09-2022




Stefan Sirges, General Manager




i.V. Pascal Kölkebeck, Sales Manager

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EN 12050-1:2001; 2015 Fäkalienhebeanlage
<p>08/2 ME (JP50342) 08/2 MES (JP50343) 08/2 M (JP50344) 08/2 MS (JP50345)</p> <p>08/2 M, EX (JP50346) 08/2 M, EX (JP50349)</p> <p>20/2 M PLUS (JP50350) 20/2 M PLUS (JP50351)</p> <p>20/2 M PLUS EX (JP50352) 20/2 M PLUS EX (JP50353) 20/2 M PLUS EX (JP50354) 20/2 M PLUS EX (JP50598)</p>
Sammeln und automatisches Heben von fäkalienfreiem und fäkalienhaltigem Abwasser über die Rückstauenebene


BRANDVERHALTEN	NPD
WASSERDICHTHEIT	Bestanden
WIRKSAMKEIT (HEBEWIRKUNG)	
- Förderung von Feststoffen	Bestanden
- Rohranschlüsse	Bestanden
- Mindestmaße von Lüftungsleitungen	NPD
- Mindestfließgeschwindigkeit	Bestanden
- Freier Mindestdurchgang der Anlage	Bestanden
- Mindestnutz volumen	NPD
MECHANISCHE FESTIGKEIT	
- Tragfähigkeit und strukturelle Stabilität des Sammelbehälters für die Verwendung außerhalb von Gebäuden	NPD
- Strukturelle Stabilität des Sammelbehälters für die Verwendung innerhalb von Gebäuden	NPD
GERÄUSCHPEGEL	70 dB(A)
DAUERHAFTIGKEIT	
- der Wasserdichtheit und Luftdichtheit	Bestanden
- der Hebewirkung	Bestanden
- der mechanischen Festigkeit	Bestanden
GEFÄHRLICHE SUBSTANZEN	NPD

 0197
JUNG PUMPEN GmbH - Industriestr. 4-6 33803 Steinhagen, Germany 13 417.16.2022.09
EN 12050-1:2001; 2015 Lifting plant for wastewater containing faecal matter
<p>08/2 ME (JP50682) 08/2 MES (JP50683) 08/2 M (JP50344) 08/2 MS (JP50345)</p> <p>20/2 M PLUS (JP50350) 20/2 M PLUS (JP50351)</p>
Collection and automatic lifting of wastewater without sewage and wastewater containing faecal matters above the backflow level

REACTION TO FIRE	NPD
WATERTIGHTNESS	Pass
EFFECTIVENESS (LIFTING EFFECTIVENESS)	
- Pumping of solids	Pass
- Pipe connections	Pass
- Minimum dimensions of ventilating pipes system	NPD
- Minimum flow velocity	Pass
- Minimum free passage of the plant	Pass
- Minimum useful volume	NPD
MECHANICAL RESISTANCE	
- Load bearing capacity and structural stability of collection tank for use outside buildings	NPD
- Structural stability of collection tank for use inside buildings	NPD
NOISE LEVEL	70 dB(A)
DURABILITY	
- of structural stability	Pass
- of lifting effectiveness	Pass
- of mechanical resistance	Pass
DANGEROUS SUBSTANCES	NPD

 0197
JUNG PUMPEN GmbH - Industriestr. 4-6 33803 Steinhagen, Germany 13 417.16.2022.09
EN 12050-1:2001; 2015 Estação elevatória para águas residuais contendo matéria fecal
<p>08/2 ME (JP50342) 08/2 MES (JP50343) 08/2 M (JP50344) 08/2 MS (JP50345)</p> <p>08/2 M, EX (JP50346) 08/2 M, EX (JP50349)</p> <p>20/2 M PLUS (JP50350) 20/2 M PLUS (JP50351)</p> <p>20/2 M PLUS EX (JP50352) 20/2 M PLUS EX (JP50353) 20/2 M PLUS EX (JP50354) 20/2 M PLUS EX (JP50598)</p>
Coleta e levantamento automático de águas residuais sem esgoto e águas residuais contendo matérias fecais acima do nível de refluxo

REAÇÃO AO FOGO	NPD
ESTANQUEIDADE	Pass
EFICÁCIA (EFICÁCIA DE ELEVAÇÃO)	
- Bombeamento de sólidos	Pass
- Conexões de tubagem	Pass
- Dimensões mínimas do sistema de tubos de ventilação	NPD
- Velocidade de fluxo mínimo	Pass
- Passagem livre mínima da instalação	Pass
- Volume útil mínimo	NPD
RESISTÊNCIA MECÂNICA	
- Capacidade de carga e estabilidade estrutural do tanque de coleta para uso externo a edifícios	NPD
- Estabilidade estrutural do tanque de coleta para uso em edifícios	NPD
NÍVEL DE RUÍDO	70 dB(A)
DURABILIDADE	
- de estabilidade estrutural	Pass
- eficácia de elevação	Pass
- de resistência mecânica	Pass
SUBSTÂNCIAS PERIGOSAS	NPD

 0197
JUNG PUMPEN GmbH - Industriestr. 4-6 33803 Steinhagen, Germany 13 417.16.2022.09
EN 12050-1:2001; 2015 Stazione di sollevamento per acque reflue contenenti materiale fecale
<p>08/2 ME (JP50342) 08/2 MES (JP50343) 08/2 M (JP50344) 08/2 MS (JP50345)</p> <p>08/2 M, EX (JP50346) 08/2 M, EX (JP50349)</p> <p>20/2 M PLUS (JP50350) 20/2 M PLUS (JP50351)</p> <p>20/2 M PLUS EX (JP50352) 20/2 M PLUS EX (JP50353) 20/2 M PLUS EX (JP50354) 20/2 M PLUS EX (JP50598)</p>
Raccolta e sollevamento automatico di acque reflue prive di sostanze fecali e di acque reflue contenenti sostanze fecali al di sopra del livello di ristagno

INFIAMMABILITÀ	NPD
IMPERMEABILITÀ	Superata
EFFICACIA (CAPACITÀ DI SOLLEVAMENTO)	
- Pompaggio di materiali solidi	Superata
- Collegamenti al tubo	Superata
- Misure minime delle linee di ventilazione	NPD
- Velocità di scorrimento minima	Superata
- Passaggio libero minimo dell'impianto	Superata
- Volume utile minimo	NPD
RESISTENZA MECCANICA	
- Capacità di carico e stabilità strutturale del serbatoio di raccolta per l'uso al di fuori degli edifici	NPD
- Stabilità strutturale del serbatoio di raccolta per l'uso all'interno degli edifici.	NPD
SOGLIA DI RUMOROSITÀ	70 dB(A)
DUREVOLEZZA	
- della stabilità strutturale	Superata
- della capacità di sollevamento	Superata
- della resistenza meccanica	Superata
SOSTANZE PERICOLOSE	NPD

Bei Motoren der Betriebsart **abweichend von S1 und am Frequenzumrichter** ist als alleiniger Überlastschutz eine Kombination aus in die Wicklung eingebetteten Temperaturfühler(n) z.B. Kaltleitern (PTC-Widerstand) und Auslösegerät zulässig. Dabei ist für Phase mindestens ein Fühler vorzusehen.

Die Einrichtung zur direkten Temperaturüberwachung besteht aus
 in die Wicklung eingebauten Temperaturfühler(n)
 (Kaltleiter DIN 44 082-150 °C) und einem
 nach RL 94/9/EG hierfür funktionsgeprüftem Auslösegerät.

Die Zusammengehörigkeit von Motor und Überwachungseinrichtung wird auf dem Motor durch ein Zusatzschild gekennzeichnet.

Überstromschutzeinrichtungen mit stromabhängig verzögerter Auslösung sind hierbei als zusätzliche Überwachung anzusehen.

Bei Motoren mit Kaltleiterschutz muss sichergestellt sein, dass bei festgebremstem Läufer und einem Verhältnis $I_{d/I_n} = 2,7$ die Auslösezeit $t_a = 49,3$ s mit einer Toleranz von ± 20 % eingehalten wird. Dabei ist vom kalten Motor (20 °C) und einer Netzspannung von 400 V bei 50 Hz auszugehen.

Überwachungseinrichtungen müssen den Anforderungen nach der Richtlinie 94/9/EG und EN 1127-1 genügen. Werden nicht zugelassene Überwachungsgeräte verwendet, ist die Funktionsprüfung gesondert nachzuweisen und zu dokumentieren. Die Geräte sind mit in die regelmäßige Überwachung des Betreibers einzubeziehen. Entsprechende Hinweise sind in der Betriebsanleitung des Motors anzugeben.

Bewertungs- und Prüfbericht: PTB Ex 11-11005

Zertifizierungssektor Explosionschutz
 im Auftrag

Braunschweig, 25. Juli 2011




Dr.-Ing. U. Klausmeyer
 Direktor und Professor

The togetherness of motor and monitoring device is marked on the motor by an additional sign.

Over-current protection with inverse time-delay in this case is to be considered as additional monitoring.


For motors with PTC thermistor has to be ensured that with a locked rotor and a ratio of $I_{d/I_n} = 2,7$, the release time $t_a = 49,3$ s will be maintained at a tolerance of $\pm 20\%$. This applies for a cold motor (20 °C) and a rated voltage of 400 V at 50 Hz.

Monitoring equipment must meet the requirements of Directive 94/9/EC and EN 1127-1. Where uncertified monitoring equipment is used, the functional test has to be carried out and documented separately. The devices must be included in the regular monitoring of the user. Guidance must be given in the manual of the motor.

Assessment and Test Report: PTB Ex 11-11005

Zertifizierungssektor Explosionschutz
 On behalf of PTB:

Braunschweig, July 25, 2011

Dr.-Ing. U. Klausmeyer
 Direktor und Professor

Datenblatt 02 zur EG-Baumusterprüfbescheinigung PTB 11 ATEX 1021 X

der Firma Jung Pumpen GmbH, 33803 Steinhausen, Deutschland
für Tauchpumpenmotor Typ D 71 - 2 / 105 B bzw. D 71 - 2 / 105 BK
Bemessungsgrößen und Daten

Diese Bescheinigung gilt unter der Voraussetzung, dass sich die Motoren dieses Typs hinsichtlich der elektrischen und thermischen Beanspruchungen nur unwesentlich von dem geprüften Muster unterscheiden, für die folgenden Ausführungen:

Leistung (Aufnahme):	2,4	kW		
Leistung P2 (Abgabe):	2,04	kW		
Spannung:	218...242	380...420	655...725	V
Strom:	7,0	4,0	2,3	A
Leistungsfaktor:	0,899...0,85			
Frequenz:	50 oder 60			
Drehzahl:	2700...3300			
Fördermedientemperatur:	max.	40	°C	
Betriebsart:	S1 mit max. 11 cm ausgetauchtem Motor			
	S2 (12 min.) ¹⁾			
	S3 (25 %) ¹⁾			

¹⁾ Spieldauer 10 min.

Die Bescheinigung gilt auch für Motoren mit einer geringeren Leistung. Aber maximal bis zu 2,4 kW. Die entsprechenden Daten sind vom Hersteller auf dem Leistungsschild anzugeben.

Neben den oben angegebenen Spannungen sind auch dazwischen liegende Werte zulässig. Die zugehörigen Ströme sind im reziproken Verhältnis der Spannungen umzurechnen. Gegenüber den Bemessungswerten darf die Netzspannung bis zu $\pm 5\%$ und die Netzfrequenz bis zu $\pm 2\%$ entsprechend dem Bereich A nach EN 60034-1 schwanken.

Temperaturüberwachung

Bei Motoren der Betriebsart S1 ist gemäß EN 60079-14 Abs.7 als alleiniger Schutz vor Überlastung eine Überstromschutzeinrichtung mit stromabhängig verzögerter Auslösung (Motorschutzschalter) oder eine Kombination aus in die Wicklung eingebetteten Temperaturfühlern z.B. Kaltleitern (PTC-Widerstand) und Auslösegerät zulässig.

Bei Motoren der Betriebsart abweichend von S1 und am Frequenzumrichter ist als alleiniger Überlastschutz eine Kombination aus in die Wicklung eingebetteten Temperaturfühlern z.B. Kaltleitern (PTC-Widerstand) und Auslösegerät zulässig. Dabei ist für Phase mindestens ein Fühler vorzusehen.

Blatt 1/2

DATA SHEET 02 TO EC-TYPE-EXAMINATION CERTIFICATE PTB 11 ATEX 1021 X

Manufacturer: Jung Pumpen GmbH
33803 Steinhausen, Germany
Submersible-pump motor type D 71 - 2 / 105 B or D 71 - 2 / 105 BK

Ratings

This certificate is valid for the following designs providing the motors of this type differ only negligibly from the sample tested as regards the electrical and thermal stresses:

Power P1 (input)	2.4	kW		
Power P2 (output)	2.04	kW		
Voltage:	218...242	380...420	655...725	V
Current:	7.0	4.0	2.3	A
Power factor:	0.899 or 0.85			
Frequency:	50 or 60			
Speed:	2700...3300			
Ambient temperature:	max.	40	°C	
Duty Type:	S1 with max. 11 cm non-submerged motor			
	S2 (12 min.) ¹⁾			
	S3 (25 %) ¹⁾			

¹⁾ cycle time 10 min.

The certificate is also valid for motors with a lower power input, but up to 2.4 kW as a maximum. The manufacturer must state the corresponding data on the nameplate.

In addition to the above-mentioned voltages, intermediate values are allowed. The associated currents are to be converted in the inverse ratio of the voltages. The mains voltage may vary by up to $\pm 5\%$ and the mains frequency by up to $\pm 2\%$ from the rated values, in keeping with range A according to EN 60034-1.

Temperature monitoring

For motors, operating in mode S1 according to EN 60079-14 para.7, an overcurrent protection device with inverse time-delay (motor controller) or a combination of temperature sensors, embedded in the winding, eg. Thermistors (PTC resistor) and relays is allowed as sole protection against overload.

For motors, operating in differing modes than S1 and at converters, a combination of temperature sensors embedded in the winding, eg. Thermistors (PTC resistor) and relays is allowed as the only overload protection. Thereby for each phase at least one sensor has to be provided.

The device for direct temperature monitoring consists of

temperature sensors, installed in the winding
(PTC DIN 44082-150 °C) and a

triggering device, tested according to directive 94/9/EC for this function.

Page 1/2

Die Einrichtung zur direkten Temperaturüberwachung besteht aus

in die Wicklung eingebauten Temperaturfühlern
(Kaltleiter DIN 44 082-150 °C) und einem
nach RL 94/9/EG hierfür funktionsgeprüfem Auslösegerät.

Die Zusammengehörigkeit von Motor und Überwachungseinrichtung wird auf dem Motor durch ein Zusatzschild gekennzeichnet.

Überschutzeinrichtungen mit stromabhängig verzögerter Auslösung sind hierbei als zusätzliche Überwachung anzusehen.

Bei Motoren mit Kaltleiterschutz muss sichergestellt sein, dass bei festgebremstem Läufer und einem Verhältnis $I_{d/N} = 3,1$ die Auslösezeit $t_a = 35$ s mit einer Toleranz von ± 20 % eingehalten wird. Dabei ist vom kalten Motor (20 °C) und einer Netzspannung 400 V bei 50 Hz auszugehen.

Überwachungseinrichtungen müssen den Anforderungen nach der Richtlinie 94/9/EG und EN 1127-1 genügen. Werden nicht zugelassene Überwachungsgeräte verwendet, ist die Funktionsprüfung gesondert nachzuweisen und zu dokumentieren. Die Geräte sind mit in die regelmäßige Überwachung des Betreibers einzubeziehen. Entsprechende Hinweise sind in der Betriebsanleitung des Motors anzugeben.

Bewertungs- und Prüfbericht: PTB Ex 11-11005

Zertifizierungssektor Explosionsschutz
Hr. Auftrag



Dr.-Ing. U. Klausmeyer
Direktor und Professor

Braunschweig, 25. Juli 2011

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Monitoring equipment must meet the requirements of Directive 94/9/EC and EN 1127-1. Where uncertified monitoring equipment is used, the functional test has to be carried out and documented separately. The devices must be included in the regular monitoring of the user. Guidance must be given in the manual of the motor.

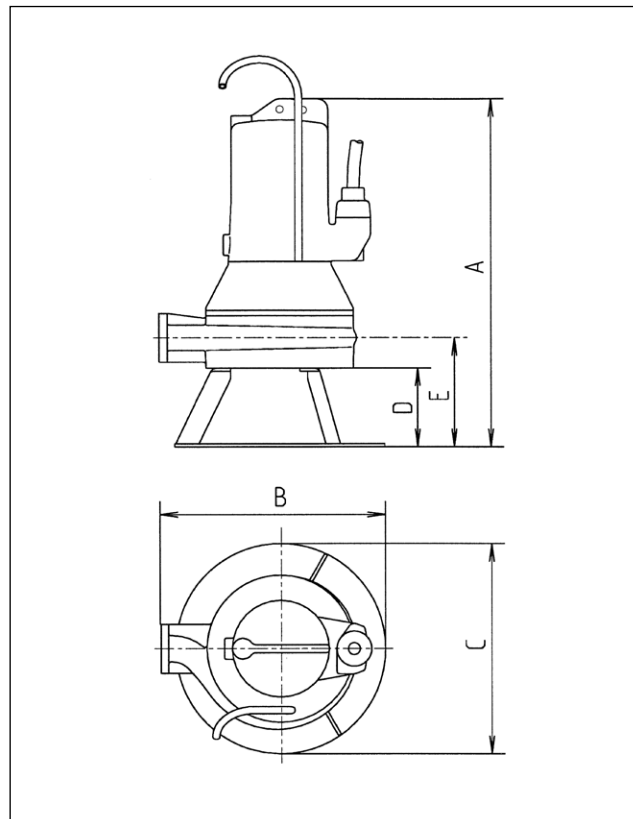
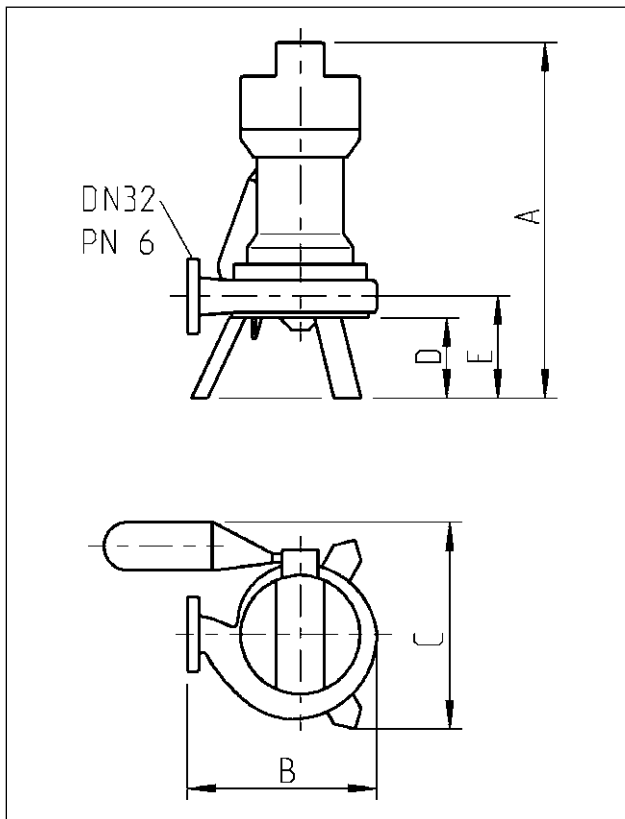
Assessment and test report: PTB Ex 11-11005

Zertifizierungssektor Explosionsschutz
On behalf of PTB:

Dr.-Ing. U. Klausmeyer
Direktor und Professor



Braunschweig, July 25, 2011




	A	B	C	D	E
08/2 ME	445	235	230	100	128
08/2 MES	445	340	255	100	128
08/2 M	445	235	230	100	128
08/2 MS	445	340	255	100	128



	A	B	C	D	E
08/2 M, EX	395	235	230	100	128
20/2 M PLUS	440	290	230	100	140
20/2 M PLUS, EX	440	290	230	100	140

Leistungen • Performance • Puissances • Capaciteit • Potência • Prestazioni • Ydeler •
Prestanda • Suorituskyvyt • Wydajności i moce • Výkony • Výkony • Teljesítmény • Capacități •
Показатели

H[m]	1	3	5	7	9	11	13	15	17	19	21	23
08/2 ME(S)	16,5	15,0	13,0	11,0	9,0	6,5	3,5					Q[m ³ /h]
08/2 M(S)	18,5	17,5	16,5	15,0	13,0	11,0	9,0	6,0	2,5			
08/2 M, EX	18,5	17,5	16,5	15,0	13,0	11,0	9,0	6,0	2,5			
20/2 M plus	18,5	18,0	18,0	18,0	17,0	16,0	15,0	13,0	11,0	9,0	6,0	3,0
20/2 M plus, EX	18,5	18,0	18,0	18,0	17,0	16,0	15,0	13,0	11,0	9,0	6,0	3,0

Technische Daten • Technical data • Données techniques • Technische gegevens • Dados técnicos • Dati tecnici • Tekniske data • Tekniska data • Tekniset tiedot • Dane techniczne • Technické údaje • Technické údaje • Műszaki adatok • Date tehnice • Технические данные

	08/2 ME	08/2 M	20/2 M PLUS
[kg]	16,0	16,5	29,0
 PN 6 [mm]	DN 32 7	DN 32 7	DN 32 7
S2	8 min.	8 min.	12 min
S3*	10 %	10 %	25 %
Motor	E 71-2/80 A	D 71-2/80 A	D 71-2/105 B
P1 [kW]	1,37	1,65	2,40
P2 [kW]	0,98	1,24	1,91
U [V]	1/N/PE ~230	3/PE ~400	3/PE ~400
f [Hz]	50	50	50
I [A]	6,0	2,8	4,0
Ader Ø	3G1,0	4G1,0	6G1,5
cos phi	0,98	0,85	0,86
n [min ⁻¹]	2705	2674	2730

	08/2 M, EX	20/2 M PLUS, EX
[kg]	23,0	29,0
 PN 6 /10 [mm]	DN 32 7	DN 32 7
S2	20 min.	12 min
S3*	35 %	25 %
Motor	D 71-2/80 B 11 ATEX 1021 X	D 71-2/105 B 11 ATEX 1021 X
 II 2 G	Ex db IIB T4Gb	Ex db IIB T4Gb
P1 [kW]	1,65	2,40
P2 [kW]	1,24	1,91
U [V]	3/PE ~400	3/PE ~400
f [Hz]	50	50
I [A]	2,8	4,0
Ader Ø	6G1,5	6G1,5
cos phi	0,87	0,86
n [min ⁻¹]	2800	2730

* Beispiel: 40%: 4 min Betrieb + 6 min Pause (Spieldauer 10 min)
 * Example 40%: 4 min. operation +6 min. rest (Cycle duration 10 min.)
 * Exemple: 40% = 4 min de service et 6 min de pause (Durée du jeu 10 min)
 * Eksempel: 40 % : 4 min drift + 6 min pause (spilletid 10 min)
 * Exemplo para 40%: 4 min. operação e 6 min. pausa (duração de ciclo 10 min.)
 * Esempio: 40%: 4 min. di funzionamento + 6 min. di pausa (durata del ciclo 10 min.)
 * Exempel: 40 % : 4 min drift + 6 min paus (spellängd 10 min)
 * Esimerkki: 40 % : Käyttö 4 min + tauko 6 min (käyttöjakson pituus 10 min)
 * Przykładowo 40%: 4 min pracy i 6 min przerwy (Czas cyklu 10 min)

* Příklad 40%: 4 min. provoz a 6 min. přestávka (trvání pracovního cyklu 10 min.)
 * Priklad 40%: 4 min prevádzka a 6 min prestávka (doba trvania cyklu 10 min)
 * 4 perc üzem és 6 perc szünet (ciklusidő 10 perc).
 * Exemplu 40%: 4 min funcționare și 6 min pauză (timp aproximativ 10 min)
 * Пример: 40%: 4 мин. эксплуатация + 6 мин. пауза (длительность цикла 10 мин.)

Schaltung - Circuitry

Schaltungsänderungen sind unter Verwendung von Quetschverbindern (X2) zwischen Coni-Steckverbindung (X1) und Einbaumotor vorzunehmen. Die neue Quetschverbindung muss fachgerecht hergestellt werden.

Alterations to the circuitry are to be made using crimp connectors (X2) between the conical plug connection (X1) and the built-in motor. The new crimp connection must be professionally made.

Les changements de câblage sont à effectuer en utilisant des sertissages (X2) entre fiche Coni (X1) et moteur encastré. La nouvelle connexion sertie doit être fabriquée de manière qualifiée.

Schakelingswijzigingen moeten worden uitgevoerd met gebruikmaking van knelverbindingen (X2) tussen de Coni-aansluiting (X1) en de inbouwmotor. De nieuwe knelverbinding moet professioneel worden aangebracht.

Le modifiche ai circuiti devono essere apportate utilizzando connettori a compressione (X2) tra il connettore a cono (X1) e il motore integrato. I connettori a compressione nuovi devono essere prodotti secondo lo stato dell'arte.

Kredsløbsændringer skal foretages ved brug af klemmeforbindelser (X2) mellem conistikforbindelse (X1) og indbygningens motoren. Den nye klemmeforbindelse skal fremstilles fagligt korrekt.

Kopplingsändringar ska göras med hjälp av kontaktpressningar (X2) mellan Coni-kontaktförbindelse (X1) och integrerad motor. Den nya kontaktpressningen måste tillverkas på ett fackmässigt sätt.

Kytentämuutoksissa Coni-liittimien (X2) ja kiinteästi asennetun moottorin välissä tulee käyttää puristusliittimiä (X1). Uusi puristusliitos on tehtävä asiantuntevasti.

Zmiany przełączenia realizowane są przy stosowaniu połączeń zaciskowych (X2) między złączem wtykowym Coni (X1) i silnikiem. Nowe połączenie zaciskowe należy wykonać fachowo.

Změny spínání je třeba provádět za použití stlačitelných spojů (X2) mezi násovným kontaktem Coni (X1) a motorem. Nový stlačitelný spoj musí být vytvořen odborně.

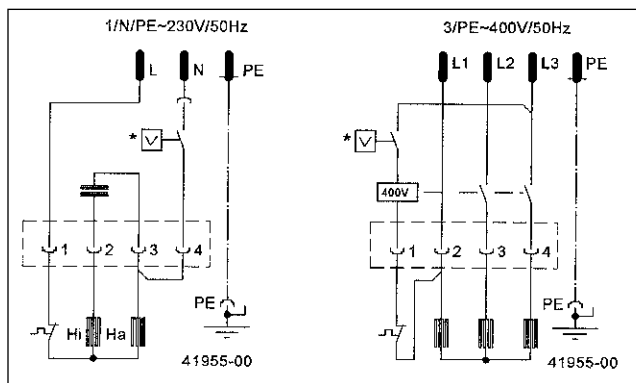
Zmeny v zapojení je možné vykonať za použitia lisovaných spojok (X2) medzi Coni konektorom (X1) a vstavaným motorom. Nové lisované spojenie musí byť odborné zhotovené.

A kapcsolás megváltoztatásához sajtolható csatlakozókat (X2) kell használni a kúpos-dugaszolható csatlakozás (X1) és a beépített motor között. Az új sajtolt csatlakozást szakszerűen kell elkészíteni.

Modificările de conectare trebuie efectuate cu folosirea de conectori de compresie (X2) între ansamblul de conectare (X1) și motorul încorporat. Noua conexiune de compresie trebuie făcută în mod profesionist.

Изменения схемы производить с применением обжимателей (X2) между разъемным соединением Coni (X1) и встроенным двигателем. Новое обжимное соединение должно быть выполнено квалифицированно.

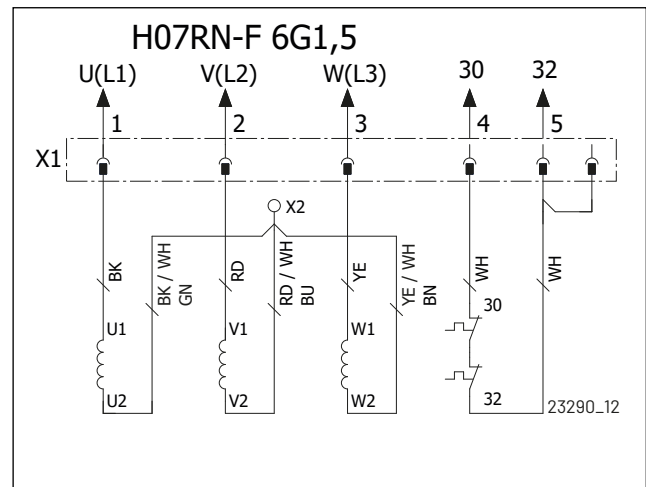
08/2 MES, 08/2 MS, 08/26 MS



Δ-Schaltung, niedrige Spannung - Δ-Circuitry for low voltage

Δ-Câblage pour basse tension Δ-Schakeling voor lage spanning Δ-Circuitos para baixa tensão Δ-Circuito per bassa tensione Δ-kredsløb til lavspænding Δ-koppling för låg spänning Δ-Kolmiokytkentä, alhai-

nen jännite Δ-Przełączenie na niskie napięcie Δ-Zapínání pro nízké napětí Δ-Zapojenie pre nízke napätie Δ-Kapcsolás kisfeszültségnél Δ-Conectare pentru tensiune joasă Δ-соединение для, низкое напряжение



Y-Schaltung, hohe Spannung - Y-Circuitry for high voltage

Y-Câblage pour haute tension Y-Schakeling voor hoge spanning Y-Circuitos para alta tensão Y-Circuito alta tensione Y-kredsløb til højspænding Y-koppling för hög spänning Y-Tähtikytkentä, korkea jännite Y-Przełączenie na wysokie napięcie Y-Zapínání pro vysoké napětí Y-Zapojenie pre vysoké napätie Y-Kapcsolás nagyfeszültségnél Y-Conectare pentru tensiune înaltă Y-соединение для, высокое напряжение

