



Instruction Manual

Thyristor controller

JTD

Manufacturer:

JÖST GmbH + Co.KG

A member of the

 **JOEST® group**

ORIGINAL INSTRUCTION MANUAL

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1 General information

- The thyristor controller can only be commissioned, operated and maintained properly, safely and reliably if this manual is used for reference.
- The manual applies only to the JT thyristor controller.
- The operating company must ensure that all relevant persons have carefully read and understood and observe the manual before starting any work.
- The operating company must provide personnel with in-house instruction, taking account of the technical qualifications of each person.
- If any of the contents of this manual cannot be understood or any questions should arise, contact the manufacturer without delay.
- The basic prerequisite for safe work is compliance with all the safety instructions and warnings and the procedural instructions contained in this manual.
- The manufacturer will not be liable for damages caused by failure to observe this manual.
- The manual must be kept ready to hand for the operator in close proximity to the thyristor controller at all times.
- Subject to technical changes in the interests of improvements to the thyristor controller.
- Illustrations in this manual are intended to facilitate basic understanding and may differ from the actual design of the thyristor controller.
- In addition to this manual the documentation for any possible auxiliary elements and all other applicable documents must also be observed.
- In addition to the safety instructions and warnings in this manual the following rules and regulations must also be observed:
 - Intended use
 - Local accident prevention regulations
 - Occupational health regulations
 - Generally accepted safety rules
 - Country-specific regulations
 - Any possible auxiliary elements included
 - Manufacturers' specifications (safety data sheets) for fuels, lubricants and auxiliaries, and chemical substances
 - Operating instructions and in-house regulations
 - Applicable EU directives (e.g. Atex) and the applicable harmonised standards

NOTICE

The product documentation issued by the manufacturer does not override the operating company's safety regulations for the complete system; the latter are deemed to be superordinate.

2 Safety

2.1 General information on safety

The “Safety” chapter provides an overview of all the key safety aspects for optimum protection of personnel and for the safe and trouble-free use of the thyristor controller, covering everything from transport and operation to disposal.

- Failure to observe the instructions and warnings contained in this manual could lead to serious safety risks for people and damage to property.
- The thyristor controller has been designed and constructed in accordance with the state-of-the-art in technology and officially approved safety guidelines and standards. The thyristor controller is operationally safe. Nevertheless, danger to the life and limb of the user or third parties and/or damage to the thyristor controller and other tangible assets can arise during use.
- The thyristor controller may only be used for its intended purpose and only if it is in perfect working order, and it must be used with due regard to safety and dangers and in accordance with the manual. Faults, especially those affecting safety, must be eliminated immediately.
- Failure to observe the safety information could result in minor injuries or even death.
- It is imperative that you observe all safety information. Observing the information is for your safety.

NOTICE

The affixed CE mark refers to the Electromagnetic Compatibility of Equipment Act (EMC Act, dated 9/11/1992).

NOTICE

The JT controller complies with the following standards and/or normative documents:

1. EN 50081-1
 2. EN 50082-2
-

2.2 Intended use

The different versions of the JTD control system are exclusively designed for connection to and use with one of the JM magnetic vibratory cells from JÖST listed in the table below.

	Thyristor controller			
	JTD 5	JTD 6	JTD 7	JTD 8
Magnetic vibratory cell	JM 5	–	–	–
	–	JM 6	–	–
	–	–	JM 7	–
	–	–	–	JM 8

Subject to observance of the following measures, the JTD thyristor controller may be used in:

- Industrial environments

Measures to be observed:

(See also Installation, page 23.)

- The supplied manufacturer's mains filter must be used.
- All control lines must be shielded and connected on one side of the control unit.
- The connecting cable between the JTD controller and the drive must be shielded and connected on both sides.

2.3 Improper use

Any use other than the use described in the "Intended use" chapter and in this operation manual and any use extending beyond the intended use will be regarded as improper use. The manufacturer will not be liable for resultant damages. The risk is borne solely by the user/operating company.

2.4 Foreseeable misuse

The following points describe the possible misuse of the thyristor controller:

- Failure to observe the operating data and exceeding or falling below limit values
- Failure to eliminate faults
- Operation without assemblies used for the safety of persons and the thyristor controller, or operation with such assemblies if they are damaged

2.5 Presentation of warnings and notices

Warnings are preluded by signal words expressing the severity of the hazard. The signal words **DANGER**, **WARNING** and **CAUTION** indicate dangers for persons.



Dangers for persons are also marked by general danger signs (warning triangle). It is imperative that these warnings are observed in order to prevent injuries or death.

The signal word **ATTENTION** indicates risks of damage to property. The notice for damage to property is not preceded by a symbol.

Warnings and notices are presented in the following form in this manual:

DANGER

Means that **death** or **severe injuries** will occur if the appropriate safety precautions are not taken. Danger to life.

WARNING

Means that **moderate injuries** could occur.

CAUTION

Means that **minor injuries** could occur.

ATTENTION

Means that **damage to property** could occur.

NOTICE

Notices are presented in highlighted form here and contain important additional information.

Notices do not contain any warnings about dangers.

2.6 Operating company responsibilities

2.6.1 Safety regulations

- The operating company is required to supplement the manual with operating instructions on the basis of regulations applicable at the place of use. These also include information relating to supervisory and reporting requirements. The aim is to take account of special operational considerations in terms of the organisation of work, the workflows and the personnel deployed.
- The operating company has sole responsibility for compliance with binding laws, rules, requirements and national regulations relating to the prevention of accidents, and any internal work, operating and safety regulations applicable to the respective place of installation.

2.6.2 Personnel, training and instruction

The operating company must ensure that the following conditions are complied with:

- Only trained personnel who are familiar with the regulations relating to occupational safety and the handling of the thyristor controller are permitted to be deployed.
- The operating company is only allowed to deploy suitable persons from whom it can be expected that they will carry out their work with responsibility. This means suitability in terms of physical and mental fitness.
- People whose reactions are influenced, for instance, by drugs, alcohol or medication must not be allowed.
- Age and occupation-specific regulations applicable at the installation location must be taken into account in relation to the selection of personnel.
- The operating company must protect personnel against health hazards and provide them with instruction before they commence their work for the first time. Thereafter the instruction must be repeated at appropriate intervals, or at least once a year as a minimum.
- The operating company must provide required protective equipment in accordance with Regulation (EU) 2016/425 on personal protective equipment (PSA-Verordnung 2016/425 PSA-V).
- Personnel must have read the operation manual and have taken part in the instruction. The participants must sign to confirm that they have understood the contents of the instruction.
- The operating company must provide required, suitable and tested equipment (tools, etc.).
- The operating company must ensure compliance with the statutory minimum age.
- The thyristor controller may only be operated, maintained, serviced and repaired by personnel who have been instructed to do so in writing by the operating company and have all the necessary qualifications.
- The scope of responsibility, the responsibility and the supervision of personnel must be precisely defined and regulated by the operating company, in order to ensure that no uncertainties about competences or gaps in authority arise.
- No unauthorised access.
- Observance of supervisory and reporting requirements.
- Explanation of instructions on what to do in the event of an emergency. For example, knowledge of first aid and the local emergency services is also required.
- Explanation about handling hazardous substances.

The operating company and/or the personnel authorised by the operating company are ultimately responsible for accident-free operations. If personnel do not have the required knowledge, they must be provided with the necessary training and instruction.

2.7 Personnel requirements

- All work is only allowed to be carried out by skilled workers who, on the basis of their technical training, experience and instruction, have adequate knowledge
 - of the state-of-the-art in technology,
 - of the way in which the magnetic drive works,
 - of safety regulations,
 - of accident prevention regulations,
 - of the applicable EU Atex directives and the applicable harmonised standards.
- The skilled workers must be capable of evaluating the work assigned to them.
- The skilled workers must be able to recognise and avoid potential dangers.
- The required personnel qualifications are subject to different statutory regulations depending on the place of installation. Unless provided otherwise by law, the permitted personnel and their minimum qualifications are defined in the table below:

Persons	Activities	Qualifications	Life cycle phase
Technical personnel (electrician)	Electrotechnical work	Technical training in electrical engineering or equivalent technical qualification (in-house training and/or external training) Permit for the maintenance of Atex products	Installation, commissioning, fault rectification, maintenance, decommissioning and dismantling
Technical personnel (operator)	Operation	Person provided with instruction on the basis of the operation manual.	Commissioning, operation, fault rectification, maintenance
Technical personnel (disposal contractor)	Disposal in accordance with regulations	Knowledge of the waste disposal regulations applicable at the place of installation.	Decommissioning, dismantling, disposal
Technical personnel (safety adviser)	Implementation of applicable safety regulations	Knowledge of the safety regulations applicable at the place of installation.	All

2.8 Information and instructions about specific dangers and residual risks

The information and instructions provided here should be understood as fundamental safety instructions about specific types of danger. These fundamental safety instructions must be observed during all work on the thyristor controller. This will prevent health hazards and dangerous situations. Special safety instructions and warnings are provided in the applicable chapters and must be followed as well.

2.8.1 Dangers due to untrained personnel

Inexperienced and unqualified personnel are a danger to themselves and others.

- Only persons with experience of carrying out the assigned work and who have been provided with instruction on the dangers are permitted to carry out the work.
- Responsibilities of personnel must be clearly defined for each life cycle phase.
- Only deploy personnel who have sufficient training and authority and who have the qualifications described in the personnel requirements.
- Trainee personnel are only allowed to work under the permanent supervision of an experienced skilled worker.

2.8.2 Dangers due to electric power

Contact with live components poses a risk of death. The consequences are serious injuries or death. In addition, electric components which are switched on can perform uncontrolled movements.

- Work on electrical systems and equipment is only allowed to be carried out by electricians and only in accordance with electrotechnical rules. Before starting any work on the electrical system:
 - Disconnect the thyristor controller from the power supply.
 - Secure it to prevent it being switched on again.
 - Check that the motors/drives and moving system parts are at a standstill.
 - Cordon off the work area with a red and white safety chain and mark it with a warning sign.
 - Verify disconnection from the power supply.
 - Earth and short-circuit.
 - Cover adjacent live parts.
- Only use voltage-insulated tools.
- Look out for damage to electrical equipment and check for such damage at regular intervals. Danger due to loose cable connections and scorched cables. Eliminate defects immediately.
- When working on live parts, call for assistance from a second person who can actuate the EMERGENCY STOP button or the main switch in the event of an emergency. In the event of a fault, switch off the power supply to the thyristor controller immediately.

3 Technical data

General data	JTD 5	JTD 6	JTD 7	JTD 8
ID number:	04 71574	04 71580	0276477	0276478
Corresponding vibratory cell:	JM5	JM6	JM7	JM8
Permissible mains voltage:	380 V - 460 V			
Mains frequency:	49 Hz - 61 Hz			
Max. continuous current for controller:	9.5 A	9.5 A	12 A	24 A
Max. continuous current for drive:	9.5 A	9.5 A	11.5 A	22 A
Mains current consumption:	approx. 2.5 A	approx. 2.5 A	approx. 2.5 A	approx. 5.0 A
Power loss:	max. approx. 90 W	max. approx. 90 W	max. approx. 90 W	max. approx. 180 W
Max. ambient conditions:	45°C			
Installed height (suspended):	approx. 360 mm			
Installed width:	approx. 152 mm			
Installed depth:	approx. 136 mm			
Mains filter:	FN3270H-10-44			
Mains filter ID number:	02 84542			
Mains filter width:	60 mm			
Mains filter height (suspended):	170 mm			
Mains filter depth:	60 mm			

4 Transport, packaging and storage

4.1 Safety

All work must be carried out only by personnel with documented training, having regard to:

- the minimum qualifications
- this manual
- all the manuals belonging to the other control unit (applicable documents, including third-party documentation)
- applicable local regulations and laws
- internal company work, operating and safety regulations

The required personal protective equipment must be worn for each activity when carrying out any work.

4.2 Symbols for transport and storage

NOTICE

The notices relating to transport and storage attached to the packaging must be observed.



Heat

Protect packages (parts) from the heat.



Wet

Protect packages (parts) from the wet and keep them dry.



Fragile

Indicates packages containing fragile or sensitive contents. Handle the package with care, do not drop it and do not expose it to impacts.



This side up

The tips of the arrows indicate which side is the top.

4.3 Transport inspection

Check the delivery for completeness and damage in transit immediately upon arrival.

If any visible external damage is discovered, proceed as follows:

- Do not accept the delivery or only accept it conditionally.
- Document the extent of the damage in the transport documents or the delivery note of the carrier.
- Initiate a claim.

NOTICE

Submit a claim for a defect as soon as it is discovered.

Claims for compensation can only be made within the applicable claim periods.

4.4 Packaging

The individual packages are packed on the basis of the anticipated transport conditions.

The packaging is intended to protect the individual components against damage in transit, corrosion and other types of damage up to the point of assembly/installation. Therefore, you should not destroy the packaging and should only remove it shortly before assembly/installation.

ATTENTION

Hazards for the environment due to incorrect disposal

Packaging materials are valuable raw materials and can be reused in many cases. The incorrect disposal of packaging materials can lead to hazards for the environment.

- Dispose of packaging materials in an environmentally responsible manner.
 - Comply with local regulations and statutory requirements for disposal. Contract a specialist contractor for disposal if necessary.
-

4.5 Storage

Store the control units under the following conditions:

- Store in the original packaging and observe any symbols relating to storage and transport which may be attached to the packaging.
- Leave the control unit which is to be put into storage in the as-delivered assembly state. The manufacturer will not be liable for any damage resulting from incorrect reassembly.
- Electrical connection appliances must always be stored in enclosed, dry and frost-free rooms.
- If the control unit is packed for ocean shipment, the packaging must not be damaged or opened.
- Do not expose them to aggressive media.
- Avoid mechanical vibrations.
- Observe the storage temperature and relative air humidity in accordance with the technical data.

5 Design and method of operation

5.1 Method of operation

The control unit and drive form a synchronised functional unit.

The control unit is connected to the three-phase mains. The voltage may be between 380 V and 460 V (effective value); the frequency may fluctuate between 49 Hz and 61 Hz.

Within these limits the control unit automatically balances any fluctuations. There is no need for any special settings and adjustments.

In the control unit the three-phase current is converted into direct current by a three-phase bridge-connected rectifier and smoothed by smoothing capacitors.

The direct current is converted by way of pulse width modulation into 2-phase alternating current using IGBT transistor modules with variable frequency and voltage.

When the unit is switched on for the first time with the connected magnetic vibratory cell (which is installed in a vibrating trough type feeder), the control unit automatically determines the suitable drive frequency for the vibration system comprised of the magnetic drive and vibrating trough type feeder using a learning process. This process must be manually triggered again if changes in weight are made at the vibrating trough type feeder.

There is a vibration sensor in the magnetic vibratory cell which measures the overall stroke (= stroke of the vibrating trough type feeder + stroke of the counter vibrating mass of the magnetic vibratory cell).

The overall stroke is automatically regulated by the control unit by changing the output voltage.

The setpoint value of the stroke can be transferred by potentiometer, voltage 0-10 V or direct current 4-10 mA to the control unit.

5.2 Design

The control unit must be bolted to the mounting plate using the keyholes.

The supplied 3-phase mains filter should be installed immediately adjacent to the control unit and wired to the control unit.

A resistor is connected to the inlet for the temperature sensor in the case of the JTD 7.

The most important components of the JTD controller are as follows:

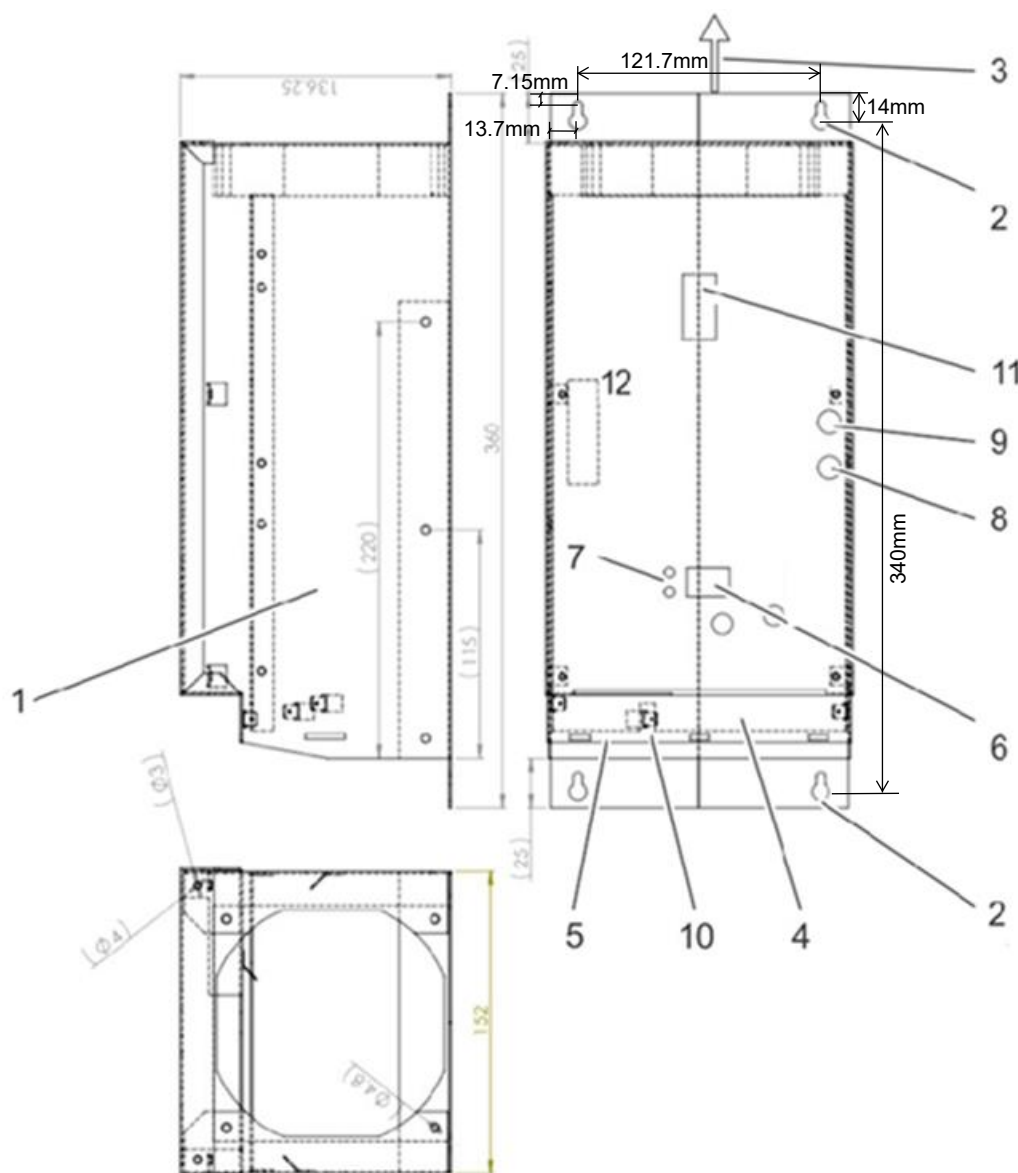


Fig. 1: Layout

- | | | | |
|---|---|----|----------------------------------|
| 1 | Metal housing | 7 | Status LED |
| 2 | Bracket for top-hat rail assembly (Ø 8.5/4.5) | 8 | Reset button |
| 3 | Air outlet of the integrated fan | 9 | CPU reset button |
| 4 | Control terminals | 10 | Dip switch 1 |
| 5 | Mains connection/drive/earth terminals | 11 | Service socket for PC connection |
| 6 | 2-character display | 12 | Dip switch or 2 drive selection |

6 Installation

6.1 Safety

DANGER

Risk of fatal injury from electric power

Contact with live components poses a risk of death. Electric components which are switched on can perform uncontrolled movements. The consequences are serious injuries or death.

- Work on the electrical system may only be carried out by electricians.
- Before starting any work on the electrical system, switch off the electric power supply and secure it to prevent it being switched on again.
- Cordon off the work area and mark it with a warning sign.

Work on electrical systems (5 safety rules)

Carelessness can lead to an electric shock. Observe the following points when working on electrical systems:

1. Disconnect the control unit from the power supply.
2. Secure it to prevent it being switched on again.
3. Verify disconnection from the power supply.
4. Earth and short-circuit.
5. Cover adjacent live parts and secure the danger area.

NOTICE

Electrical connection of the control unit must be in accordance with the regulations set out in VDE 0100 and VDE 0113. .

Where a control unit is intended for export, the electrical regulations of the country concerned must be complied with.

6.2 Connection

The different versions of the JTD control system are exclusively designed for connection to and use with one of the JM magnetic vibratory cells from JÖST listed in the table below.

	Thyristor controller			
	JTD 5	JTD 6	JTD 7	JTD 8
Magnetic vibratory cell	JM 5	–	–	–
	–	JM 6	–	–
	–	–	JM 7	–
	–	–	–	JM 8

The control unit is connected to the three-phase mains at the input side, and at the output side **only** a JM magnetic vibratory cell may be connected.

6.2.1 Cooling

The JTD controller is cooled by means of an integrated fan. The fan is switched on when the magnetic vibratory cell is started.

The preferred installation position for the control unit is vertical.

Attention should be paid to sufficient space (minimum 60 mm) for the air inflow (bottom) and air outflow (top) when it comes to installation.

The control unit is not suitable for dusty air. If the fins of the heat sink become covered with dust, the temperature of the transistors will rise and the control unit will switch off!

6.2.2 Fastening in the control cabinet

The control unit must be bolted to the control cabinet plate.

It should be installed in a shock and vibration-free location.

The mains filter should be screwed onto the mounting plate leaving sufficient space to the right of the control unit.

6.2.3 Wiring

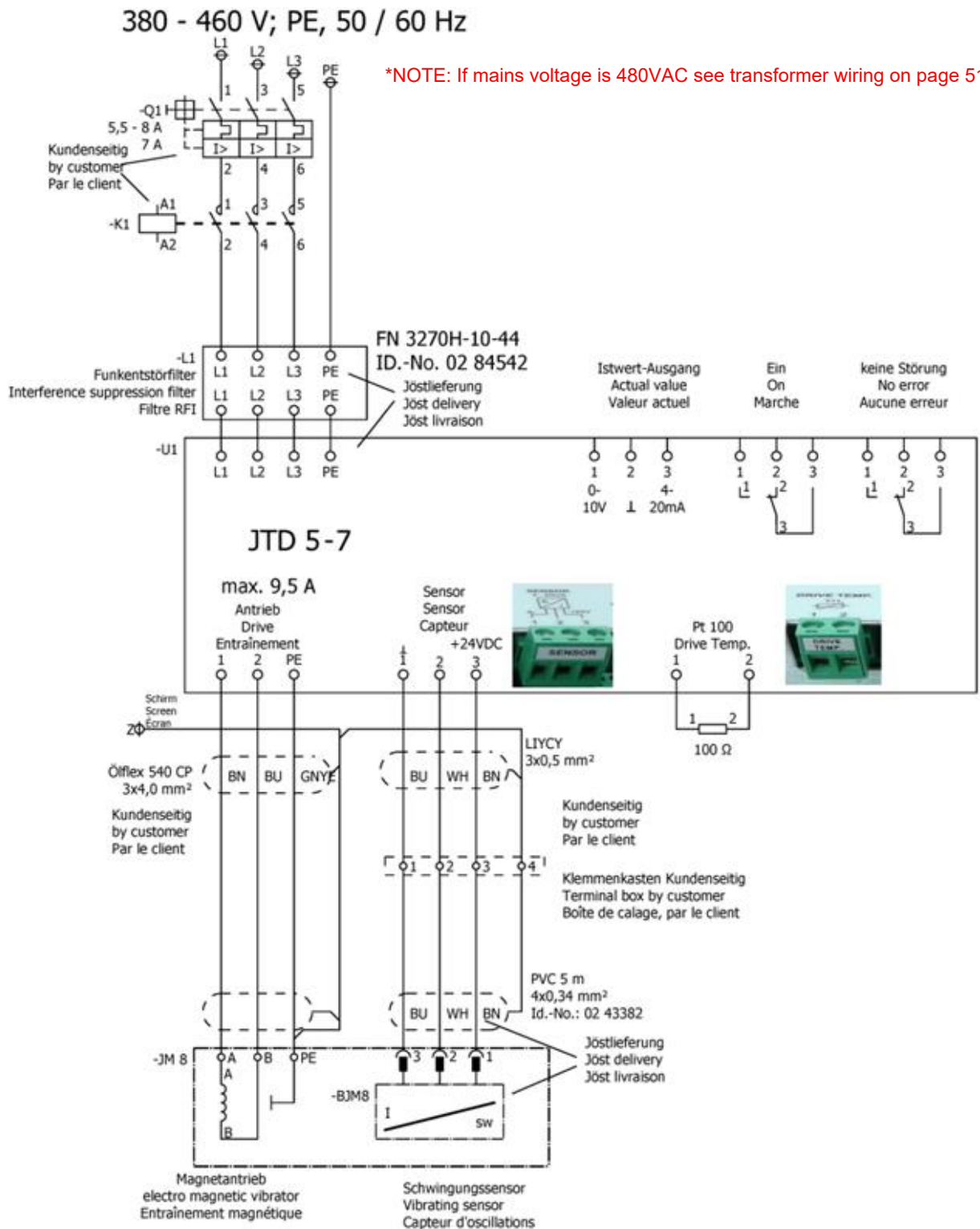


Fig. 2: Cabling JTD 5, 6, 7

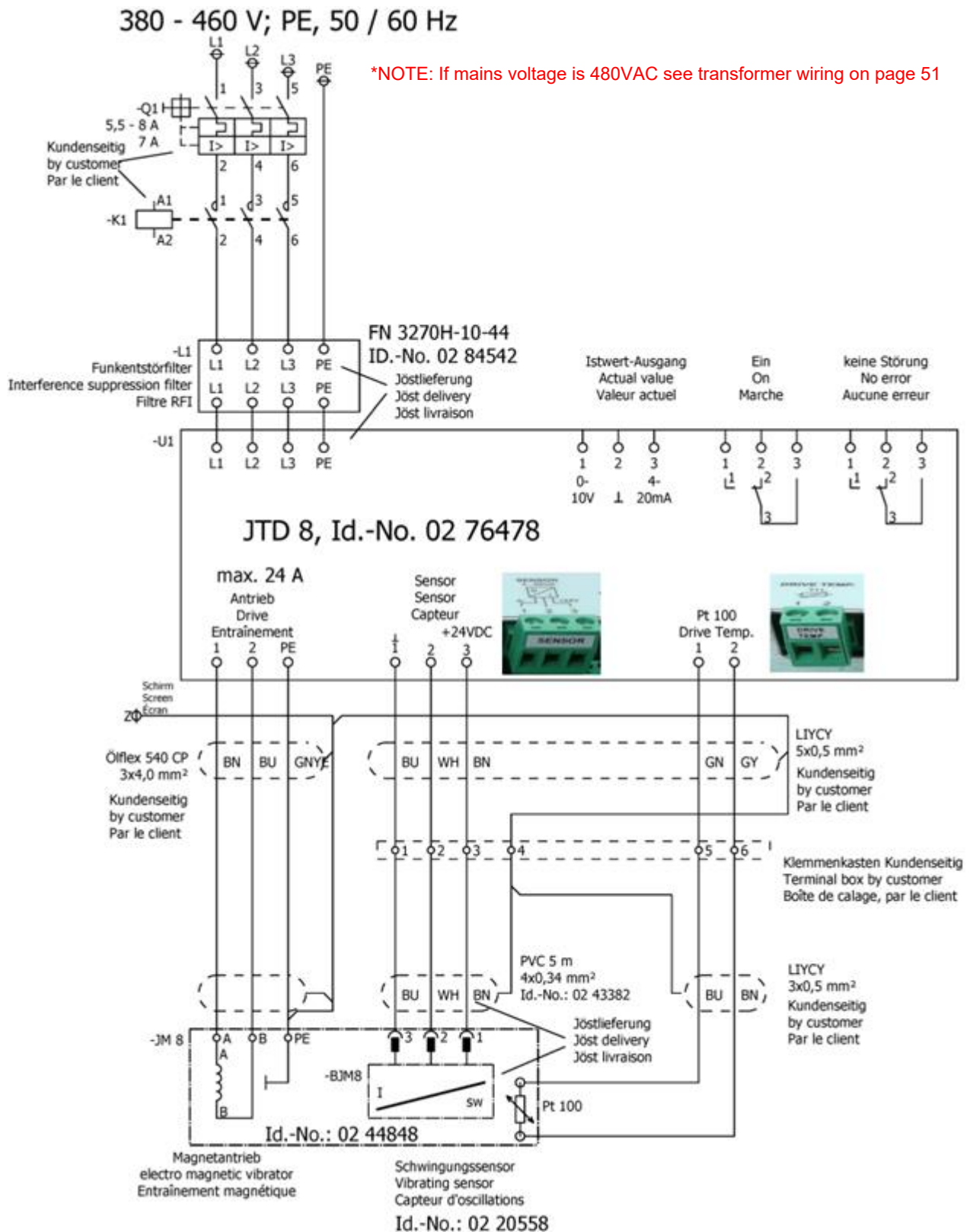


Fig. 3: Cabling JTD 8

Mains and drive cable:

Values are based on a cable length of 50 m between the control unit and the drive. For longer distances, the drive cable cross-sections must be increased accordingly.

The supplied 3-phase mains filter must be installed between the mains and the control unit to avoid mains interference.

The JTD 5-8 has a mains filter type FN3270H-10-44,
ID No. 02 84542.

Drive connection:

A shielded cable must be used between the JTD controller and the JM drive. The shield connection must have a large area on both sides and be laid short to ground.

A cable of type Ölflex 540P 3x2.5 mm² (JM7) or Ölflex P 3x4.0 mm² (JM8) must be used directly at the drive. This is important because of the vibration load on the cable.

Connection of the vibration sensor:

A cable with cable socket, approx. 5 m long, is supplied for the vibration sensor. The cable must be laid to a terminal box by the customer.

It must be ensured that the cable does not chafe at any point!

For the assignment of the cable colours, see the circuit diagram.

Connection of the temperature sensor (for JM8 and JTD24 only):

The shielded cable (provided by the customer) must be connected to the separate terminals in the connection box of the drive. At the terminal box (provided by the customer), the shield must be earthed. The signal will then be carried together with the signal of the vibration sensor to the control unit in a shielded 5-core cable (provided by the customer). The shield must also be earthed at the control unit.

Control cable:

The control cables must be shielded. We recommend shielded, multi-core, flexible cables with a conductor cross-section of 0.5 or 0.75 mm² for the control connection.

NOTE

Earth the cable shield - as short as possible - at the JTD controller only.

Control cables must be positioned at least 0.5 m from the drive cable in order to avoid interference.

Motor circuit-breaker:

The motor circuit-breaker (Q1 in the circuit diagram) does not serve as overload protection for the drive, but simply has the function of short-circuit protection in case of a control unit defect.

For JM5, JM6 and JM7, Q1 should be 2.8-4.0 A in size and be set to 3.5 A.

For JM8, Q1 should be 5.5-8.0 A in size and be set to 7.0 A.

6.2.4 Control connections

The connector blocks on the control unit are marked according to their use.

Start enable “ENABLE” labelling

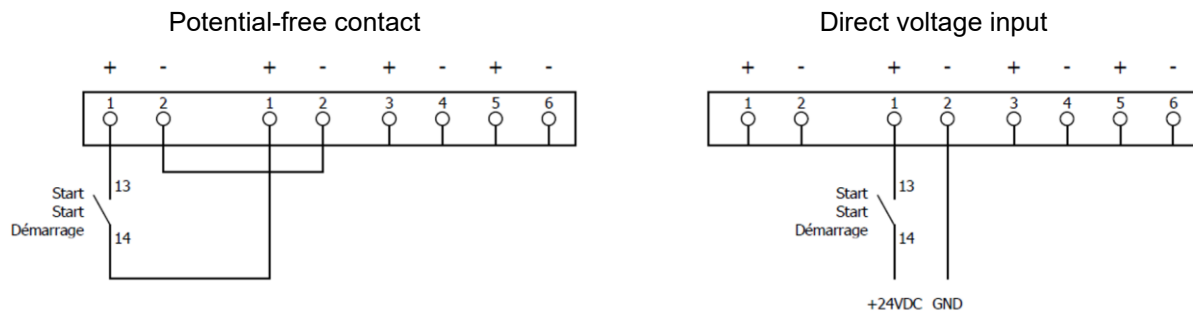


Fig. 4: Start enable

The drive is switched on by an external start enable. The control unit itself must be connected to the mains voltage for at least 30 seconds prior to the drive being switched on. During this time the smoothing capacitors are charged. The microcontroller conducts a self-test.

The signal of the start enable is processed in an isolated manner by means of an optocoupler in the control unit. This permits the 24V signal of the external PLC to be connected directly to the control input.

If an external potential-free contact is used, the internal voltage of the control unit must be connected to the contact.

Setpoint value “SET VALUE” labelling

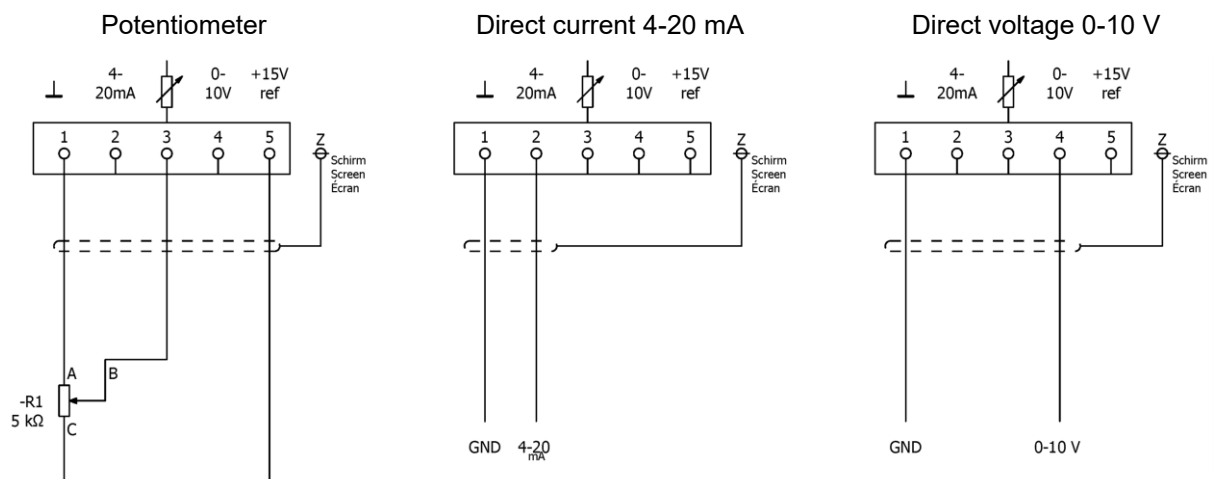


Fig. 5: Setpoint value

Potentiometer, coarse - fine

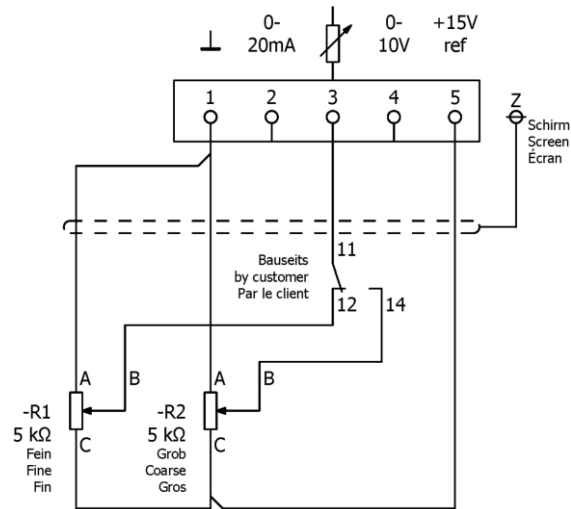
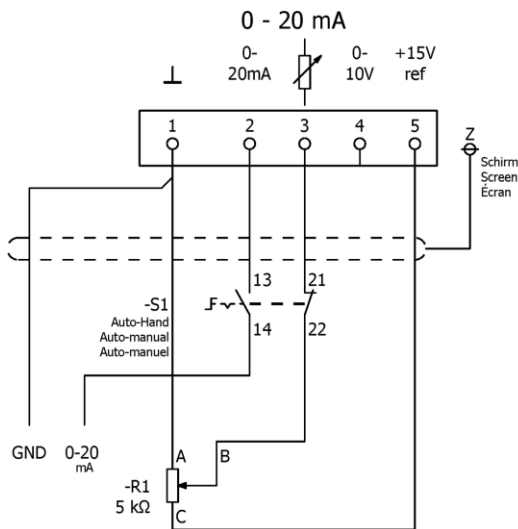


Fig. 6: Potentiometer

Changeover

Poti (manual) 0-20 mA (automatic)



Poti (manual) 0-10 V (automatic)

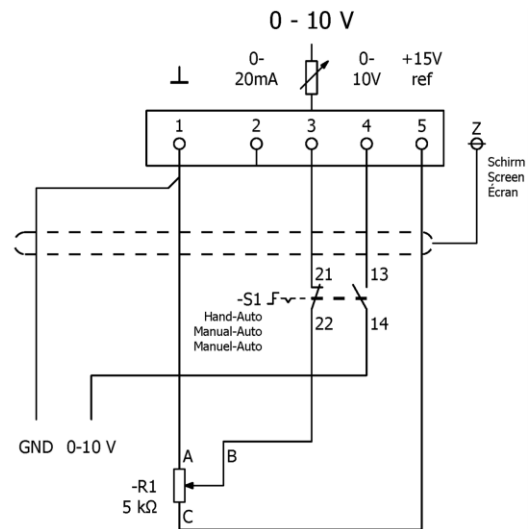


Fig. 7: Changeover

The control unit automatically recognises which terminals are connected and uses these as the setpoint source. The terminals which are not needed must not be connected up.

The setpoint inputs are carried on a potential-free basis in the control unit via optocoupler.

Check-back signals

“ACTUAL VALUE” “ON” “NO ERROR” labelling

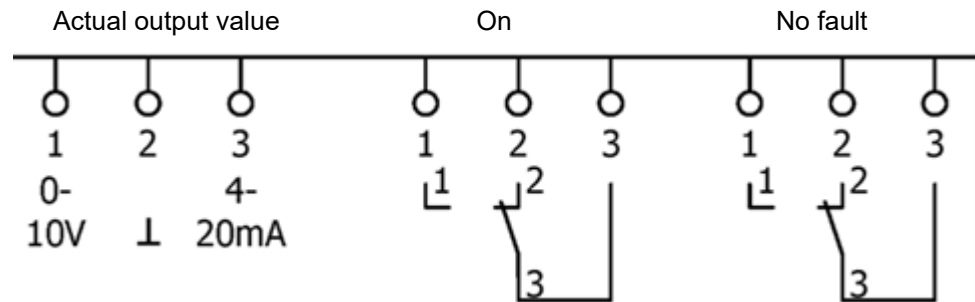


Fig. 8: Check-back signals

The actual value output is designed to trigger a high ohmic PLC analogue input.

The voltage and current signal corresponds to a stroke of approximately 120% as a maximum value. The analogue input of the PLC should be adjusted accordingly during commissioning.

The “ON” and “NO ERROR” signals are created by relay contacts. When the control unit is in the de-energised state, the relay contacts are as shown above.

Unused connection terminals

Two digital inputs “OPTION1” and “OPTION 2” are provided for potential functional extensions and for service purposes.

There are also two DIP switches fitted to the underside of the housing.

Both are for service purposes and are set to “OFF” in normal operation.

6.2.5 Special features of the control

** DANGER****Risk of fatal injury due to electric shock!**

The drive is not de-energised when the drive is switched off using the start enable.

After switching off the mains voltage the drive may be under voltage until the capacitors have completely discharged!

Output-side switching

Switching off the drive during operation via a contactor between control unit and drive is not permitted!

Actual value failure protection

In the event of the failure of the actual value, e.g. due to damage to the vibration sensor, break in the sensor cable, etc., the controller switches off and shows an error code on the display.

Switching the setpoint signal

If the setpoint cables are to be connected, relays with gold contacts or hermetically sealed relays must be used because of the low switching voltage ($U \leq 10V$, $I \leq 20mA$).

Coarse/fine current applications

A setpoint presetting for coarse/fine current is possible for dosing and weighing applications.

If the setpoint value is preset using potentiometers, a second potentiometer is required (-> order separately).

The setpoint value for coarse current is preset using the first potentiometer and the setpoint value for fine current using the second.

If the setpoint signal comes from a PLC controller, this can adjust the setpoint accordingly.

Manual/automatic application

Manual/automatic application means that the actual setpoint (-> automatic) comes from an external source (control unit/PLC as mA or V).

By switching over, a setpoint can be provided by a manual potentiometer (-> manual) instead of the automatic setpoint of the controller.

7 Commissioning

7.1 Safety

All work must be carried out only by personnel with documented training, having regard to:

- the minimum qualifications
- this manual
- all the manuals belonging to the other machines (applicable documents, including third-party documentation)
- applicable local regulations and laws
- internal company work, operating and safety regulations

The required personal protective equipment must be worn for each activity when carrying out any work.

NOTICE

The manufacturer will not be liable for any damage resulting from incorrect commissioning.

7.2 Preconditions for commissioning

Before switching on the mains voltage it must be ensured that the controller has been incorporated in the switchgear in accordance with the circuit diagrams and information in chapter Installation, page 23.

The correct installation of the drive cables to the drive should be confirmed by a dielectric test (control unit not connected).

- The start enable must be switched off.
- The corresponding vibrating trough type feeder must be checked to determine whether it can freely oscillate in all directions and is free from foreign bodies.
- There must be no material on the conveyor when the vibrating trough type feeder is switched on for the first time!

7.3 Switching on

Before you switch on the mains voltage, the For further information, see the Preconditions for commissioning chapter on page 33. must be fulfilled.

The mains voltage can now be switched on.

⚠ DANGER The JTD controller now carries lethal voltages.

The capacitors of the control unit are charged with limited current.

After reaching the fully charged state the controller sounds an acoustic “beep-beep” signal with the integrated buzzer.

The “READY” LED lights up if there are no faults.

Two bars “- -” appear in the controller display to indicate readiness.

A green LED lights up on the connector of the vibration sensor if the sensor settings are correct.

If a number is shown on the controller display, this means that there is a fault.

The cause of the fault can be determined by checking the list of fault messages.

The integrated relay with the “NO ERROR” signal is activated (1 signal) if there is no fault. It remains switched off if there is a fault.

7.4 Switching on the vibrating trough type feeder, learning process

Switching on is signalled by the “STATUS” LED.

7.4.1 Learning process for initial start-up

The control unit automatically determines the requisite operating frequency of the magnetic vibratory cell when switched on for the first time after delivery by JÖST. The operating frequency is dependent on the natural frequency of the vibration system comprised of the magnetic vibratory cell and vibrating trough type feeder, which is dependent on the weight of the vibrating trough type feeder.

ATTENTION! The learning process must be started manually after every change in the weight of the vibrating trough type feeder or after replacement of the magnetic vibratory cell!

In order to be able to carry out the learning process correctly, the vibrating trough type feeder must be able to oscillate freely. There must be no material on the vibrating trough type feeder.

The drive must not be colder than 0°C nor hotter than 30°C.

If the temperature window is not reached during initial start-up, the learning process must be repeated once the temperature is correct.

(If the drive is too cold or too hot, the operating frequency will be sub-optimal and this could lead to higher operating current)

Once all the conditions described have been satisfied, the start enable can be activated.

The control unit acknowledges the command with the acoustic signal “beep” and signals the learning process on the display with “L e”.

During the learning process the magnetic vibratory cell runs at reduced voltage with increasing frequency. The learning process can take up to 60 seconds.

Once the appropriate operating frequency has been found, this is acknowledged by the control unit with the acoustic signal “beep, beep” and the characters “a u” are shown on the display for automatic mode.

The stroke set on the setpoint generator is now regulated.

Starting the learning process manually.

Once the conditions described above have been satisfied, the control unit can be reset to learning mode if the start enable is switched off by pressing the “RESET ERROR” button for a period of longer than 5 seconds.

After starting the drive the message “L e”. appears on the display for learning process in progress.

7.4.2 Switching on after learning process completion

The operating frequency determined in the learning process is saved in the EEPROM of the control unit and remains intact also if the voltage drops.

When the **“ENABLE”** signal is received by the controller and if there is no fault, the magnetic drive is switched on with low voltage. The voltage is then increased by the PID controller until the desired overall stroke is reached.

It may take up to 5 seconds until the maximum power is reached.

(The starting delay is necessary to prevent banging of the magnet pole faces in the magnetic vibratory cell when switching on)

The drive can be switched off with almost no delay.

8 Maintenance

The JT controller is largely maintenance-free.

If there is a lot of dust, however, regular cleaning is essential.

The current consumption of the drive should be checked during each maintenance inspection with a moving-iron ammeter or a TRMS current probe.

In addition, the maximum stroke of the vibration system must also be checked.

Refer to the separate operation manual for details relating to the vibration system.

9 Faults

9.1 Safety

In all cases the following applies:

1. In case of faults which pose a direct danger to persons or property, switch off the machine/system immediately.
2. Disconnect or switch off customer-end media and energy supplies immediately.
3. Relieve the pressure from pressurised parts.
4. Determine the cause of the fault.
5. If work in the danger area is required in order to eliminate the fault, switch off the machine/system and secure it to prevent it being switched on again unexpectedly.
6. Inform the person responsible at the place of installation immediately.
7. Depending on the type of fault, have it eliminated by trained personnel who are authorised to do such work.
8. If any components have been replaced, make sure that the new ones are fitted correctly, fit all fastening elements back in place and observe the tightening torques for the screws.

9.2 Troubleshooting

The control unit can recognise and report a number of faults.

Every fault which is recognised leads to the shutdown of the magnetic vibratory cell and to a fault message (fault code) in the display.

Up to 10 fault messages are stored in the fault memory of the control unit and can be read out by JÖST Service.

9.2.1 Acknowledging faults

Some error messages disappear automatically (display then shows "0 0") once the fault has been eliminated, whereas others are latching.

In all cases any fault occurring must be acknowledged with the start enable switched off by briefly pressing the "**RESET ERROR**" button!

9.2.2 Fault code

In the event of a fault a two-digit number is shown on the display of the control unit and the drive is switched off.

Fault code	Fault text	Fault description / cause
00	OK	Unit OK, no fault / fault eliminated
01	Emergency mode	Unit is in emergency mode
02	IGBT shutdown	Short-circuit, DC link circuit still available
03	Drive not recognised	Drive was not recognised during learning process
04	Stroke not reachable	Minimum stroke not reachable during learning process
05	Overcurrent	Shutdown due to excessively high continuous current
06	Temperature too high	Temperature in the heat sink too high
07	DC link voltage too high	DC link voltage above limit
08	Output voltage too high	Output voltage above limit
09	Mains failure	DC link voltage too low, phase failure
10	Output stage short-circuit T4	Short-circuit detected in the output stage at T4
11	Output stage short-circuit T1	Short-circuit detected in the output stage at T1
12	Output stage short-circuit T3	Short-circuit detected in the output stage at T3
13	Output stage short-circuit T2	Short-circuit detected in the output stage at T2
14	Output stage short-circuit, general	Short-circuit detected in the output stage detected, general
20	Sensor error (U=Max.)	Displacement sensor drive, signal processing fault
21	No sensor signal	Displacement sensor drive, no signal
22	Faulty sensor setting	Displacement sensor set too high/too low
25	Setpoint generator (U=Max.)	Setpoint generator, signal processing fault
26	No setpoint generator signal	Setpoint generator, no signal processing signal
30	Emergency operation not possible	Working frequency not available / learning flag not set
40	Drive temperature too high	Temperature sensor drive: Temperature
41	Temp. sensor drive fault	Temperature sensor drive: Connection fault
42	Temp. sensor drive wire break	Temperature sensor drive: Wire break
43	Temp. sensor drive short-circuit	Temperature sensor drive: Short-circuit
44	JTD temperature too high	JTD temperature too high
45	Temp. sensor heat sink Fault	Temperature sensor JTD: Connection fault
46	Temp. sensor heat sink Wire break	Temperature sensor JTD: Wire break
47	Temp. sensor heat sink Short-circuit	Temperature sensor JTD: Short-circuit
97	EEPROM read error	Read error during access to device EEPROM
98	EEPROM write error	Write error during access to device EEPROM
99	Undefined fault	Undefined fault

9.2.3 Fault rectification (user)

Sensor faults.

The control unit and the magnetic vibratory cell need the signal from the vibration sensor for proper operation.

The drive will not run without the vibration sensor!

ATTENTION! It is strongly recommended that a vibration sensor is kept available at all times as a spare part!

Message 6:

The control unit measures the temperature of the heat sink. If the temperature is too high, **fault message 06** is shown and the drive is switched off.

Action in case of message 06:

- Allow the device to cool down.
- After restarting, check whether the fan is running.
- Measure the ambient temperature. In the case of continuous operation at max. power of the magnetic vibratory cell, the maximum permitted ambient temperature is 45°C. Reduce the load where applicable or reduce the ambient temperature.
- Blow out the heat sink if the surrounding area is dusty.

Message 20:

If the cable of the vibration sensor is incorrectly connected to the control unit, or if other cables are incorrectly connected to the terminals of the sensor, the voltage level of the AD converter of the control unit may be inadmissible. In this case **fault message 20** appears on the display.

Action in case of message 20:

- Check the connection of the cables to the connector block sensor of the control unit and correct if necessary.

Message 21:

The sensor has a yellow LED. If voltage is applied and if a steel part is within the measurement area, the LED will be constantly lit.

If there is no steel part in the measurement area, the LED will flash.

If the cable connection to the sensor is interrupted, or the connector inserted loosely or incorrectly, the LED on the sensor will be off and **fault message 21** will be issued.

Action in case of message 21:

- Check the sensor feed line and sensor connector.
- Check whether the connector is in the correct position.

ATTENTION! The connector has a marking and will only fit on the sensor in one position.

Message 22:

The vibration sensor is an inductive displacement transducer which measures the distance between two oscillating components in the drive.

If the distance is not correctly set, the controller will recognise this at standstill and will issue **fault message 22**.

Action in case of message 22:

- Remove the cover and check the air gap at the sensor; correct if necessary.
ATTENTION! Tighten the lock nut hand-tight after adjustment.
 (The distance between the sensor and counterpart should be as follows: 8 mm $\pm$ 0.5 mm. The sensor signal at standstill should be approx. 12mA)

Message 26:

The control unit automatically recognises which setpoint source is connected.

If nothing is connected or wrongly connected, **fault message 26** is shown.

Action in case of message 26:

- Check the connection of the setpoint generator and correct it if necessary.

9.2.4 Overload protection for the magnetic vibratory cell

The motor circuit-breaker provided for in the circuit diagram serves only as short-circuit protection in the event of a defect in the control unit and has no function as an overload protection for the magnetic vibratory cell.

The JTD control systems and JM drives have been adapted to one another.

The current to the drive is constantly measured and checked in relation to the admissible limit.

The limit value is designed such that with an ambient temperature of 40°C and continuous load with maximum current the drive is not overloaded.

If the current of the drive becomes higher than the limit under special conditions, the power (overall stroke) is reduced until the limit is reached.

This monitoring means that in the ambient temperature range up to 40°C the drive cannot be thermally over-loaded.

If the ambient temperature significantly exceeds 40°C in continuous operation (longer than 10 hours without switching off), the drive may become too hot and fail (in this case the control unit may also become damaged beyond repair under certain circumstances).

If the hood of the magnetic drive gets covered by bulk material or dust to the extent that heat can no longer dissipate, the drive may become damaged beyond repair as a result.

A Pt100 resistance thermometer is installed in the winding of the vibratory cell (JM8 only). The temperature of the winding is measured and monitored (JTD8 only) when it is connected to the control unit in accordance with the connection diagram.

In the event of inadmissible warming, a fault code is displayed and the stroke of the drive is reduced until the value is below the temperature limit again.

10 Appendix

10.1 Connection diagram

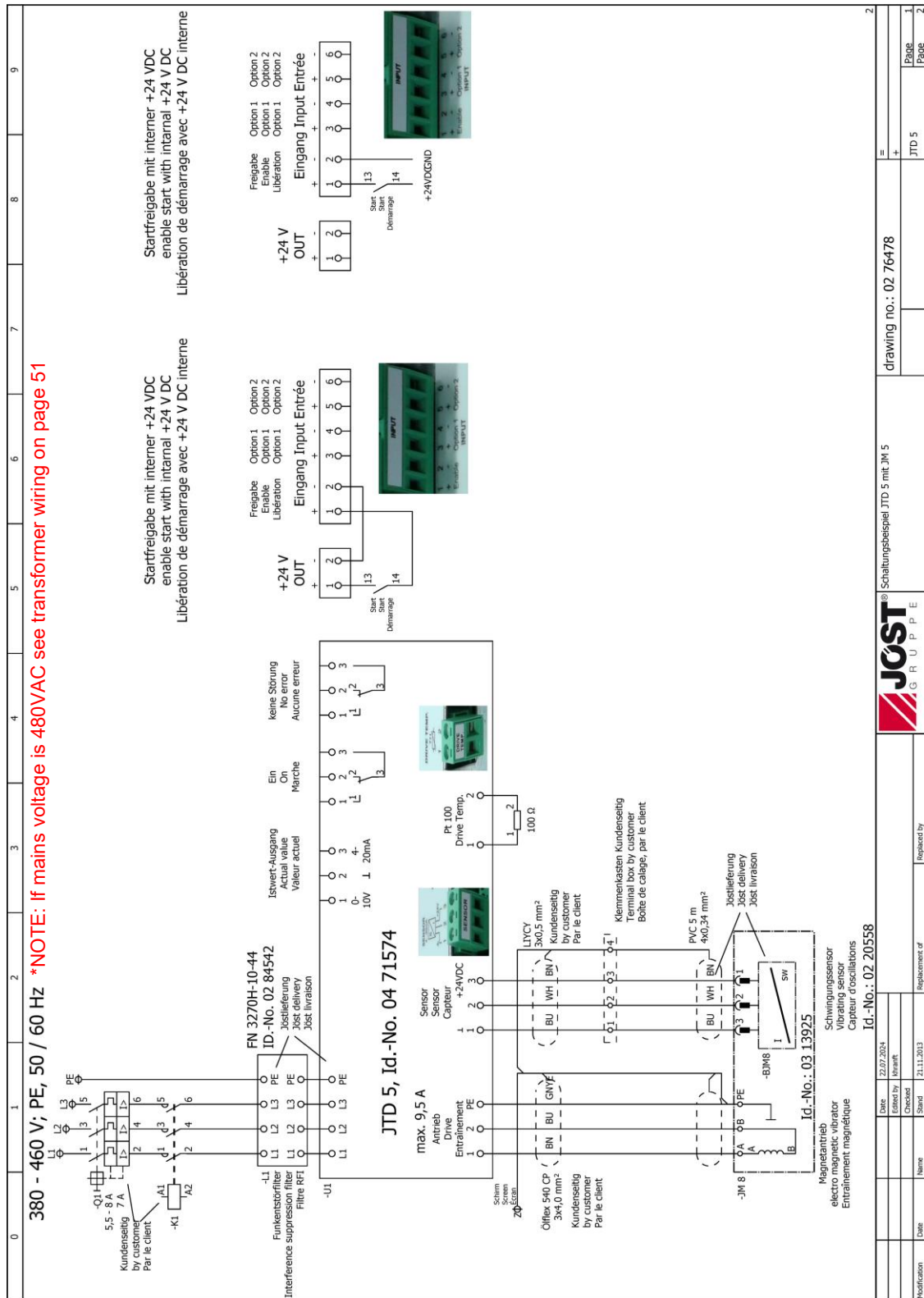
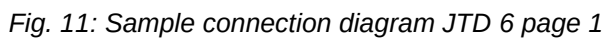


Fig. 9: Sample connection diagram JTD 5 page 1





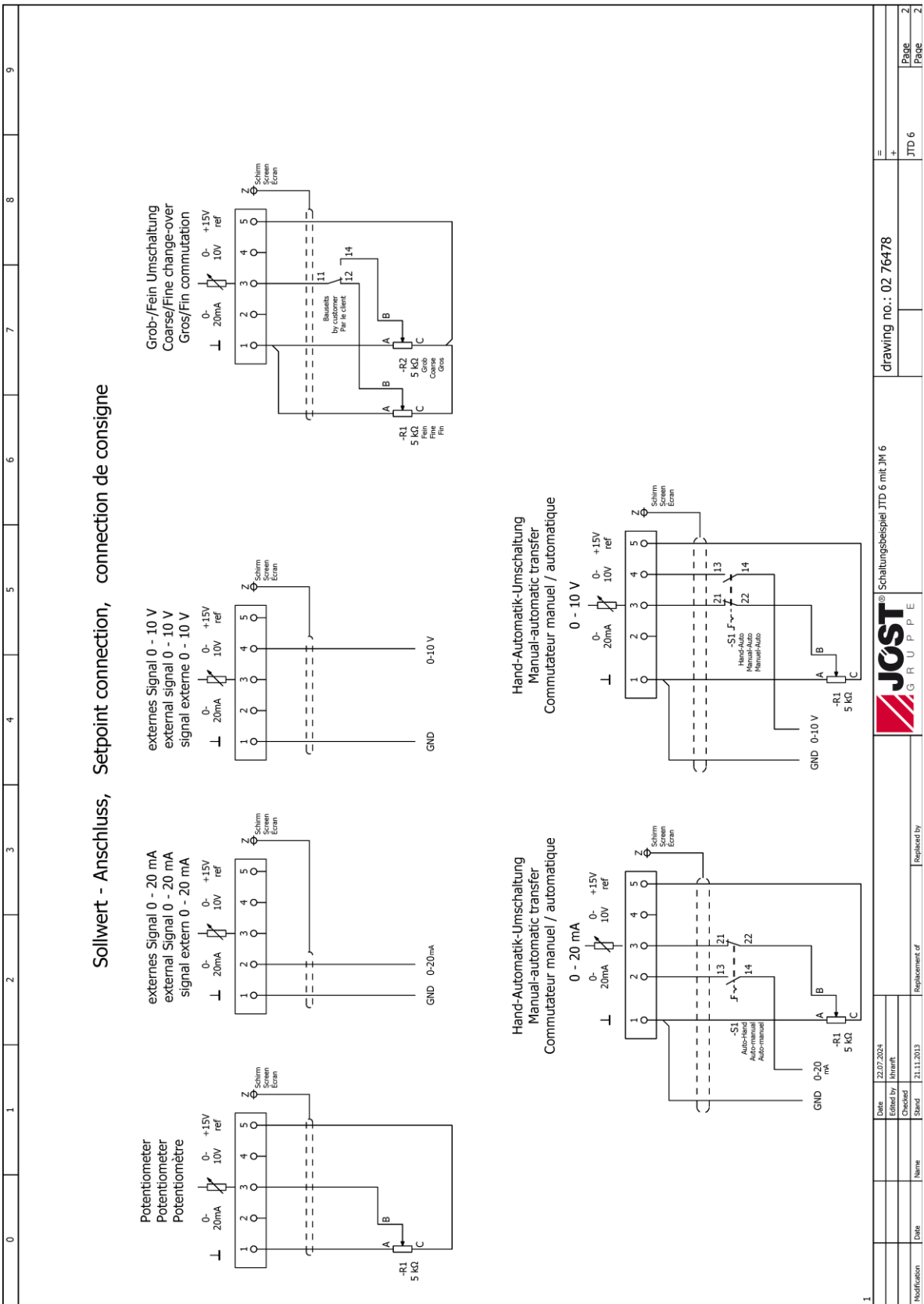


Fig. 12: Sample connection diagram JTD 6 page 2

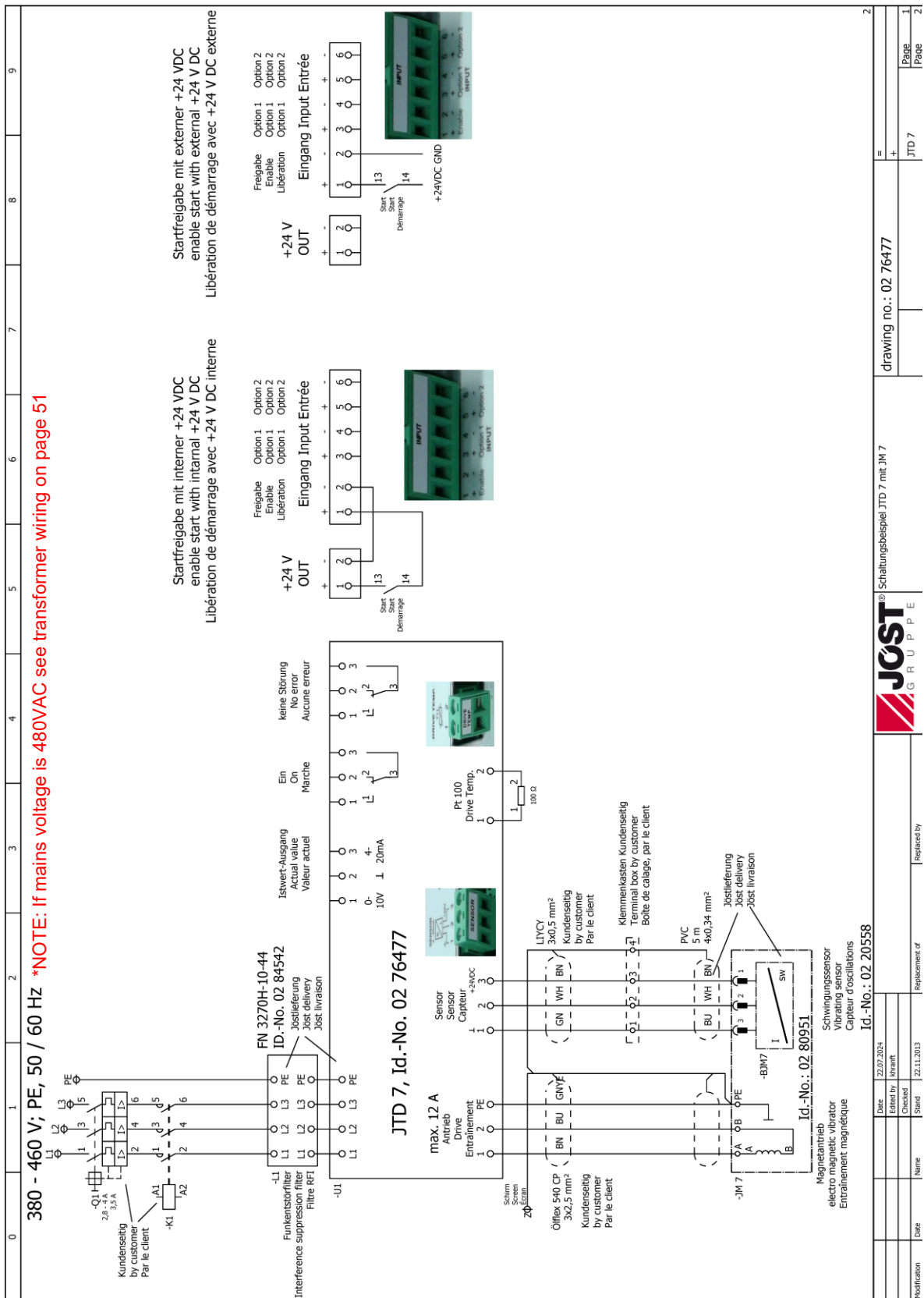
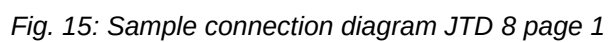


Fig. 13: Sample connection diagram JTD 7 page 1





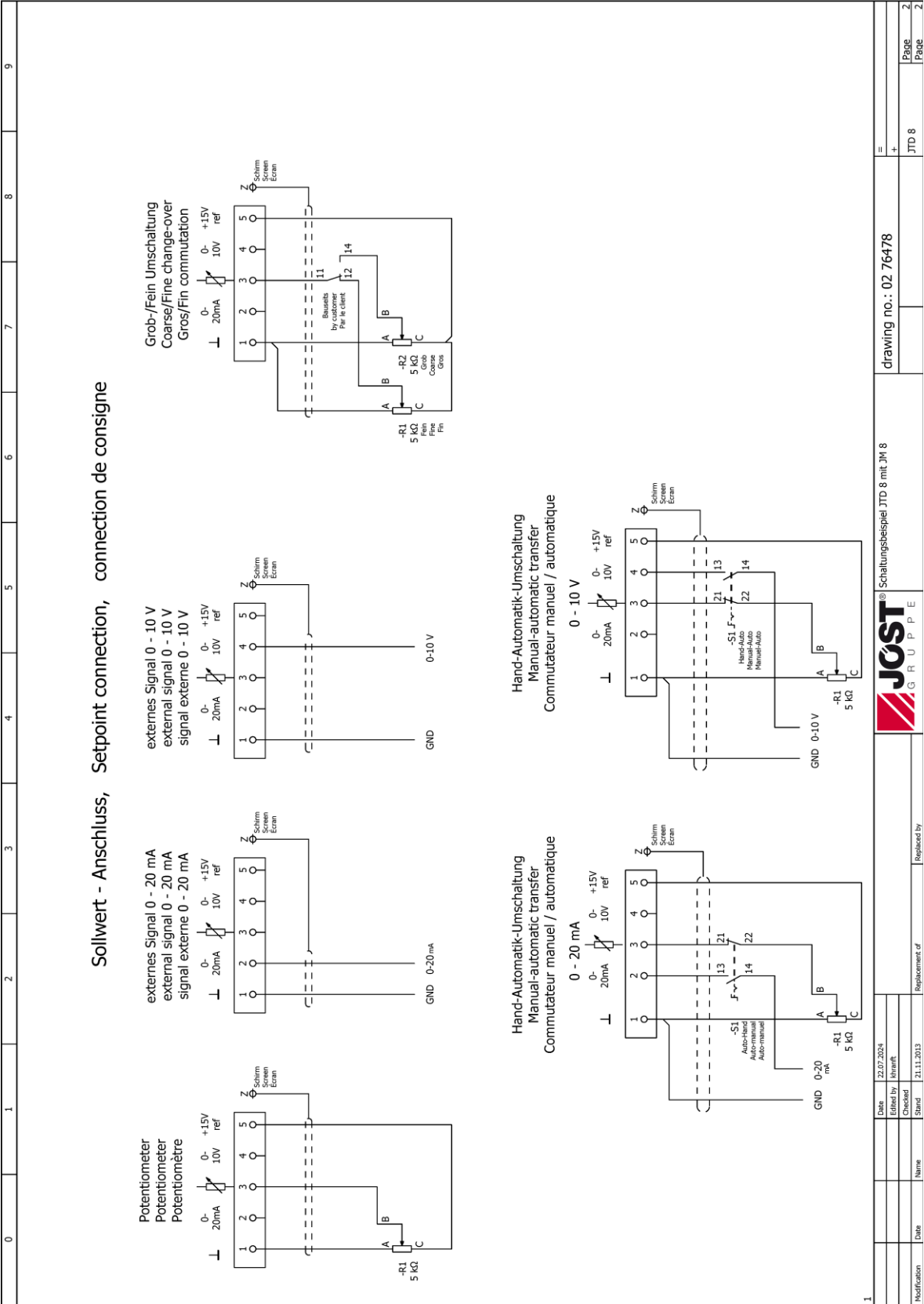
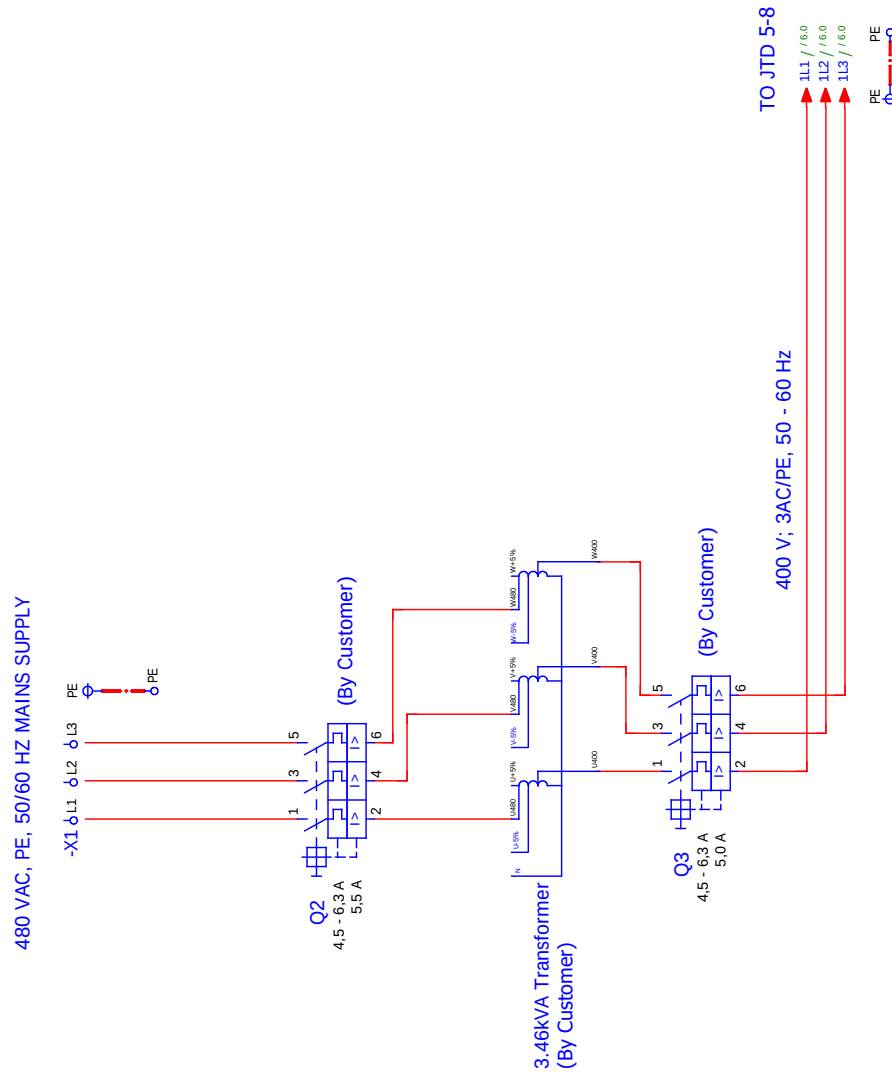


Fig. 16: Sample connection diagram JTD 8 page 2



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