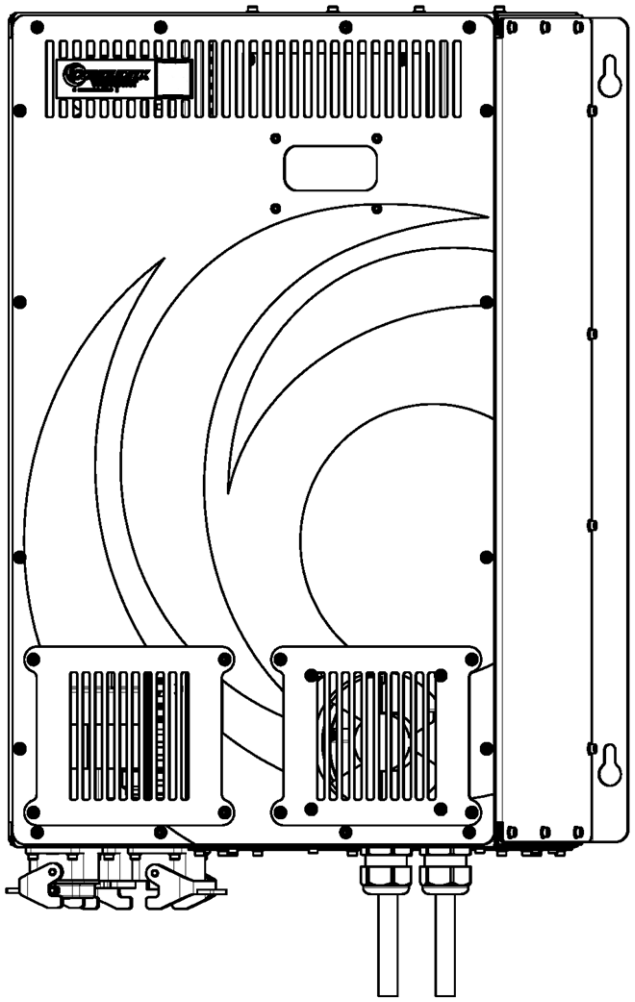
Operation Manual

Track Supply 6 kW

80 / 125 A at 400 / 480 V

Order Number

91008-111-3090873 (80 A, 400 V, RAL 7016)
91012-111-3090875 (125 A, 400 V, RAL 7016)
91008-111-3090876 (80 A, 480 V, RAL 7016)
91012-111-3090878 (125 A, 480 V, RAL 7016)
91000-111-3090877 (Configurable version)



CE

Operation Manual

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Important:
Company names mentioned in this manual that are registered and protected trade names by copyright do remain the property of the companies themselves.
We reserve the right to carry out technical modifications of illustrations and statements in these operating instructions, in order to improve the energy supply system and its function.
System related details please find in the system manuals. Refer always to the system documentation before starting any work on the system or components within the system or before operating the system.
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1 Understanding

This document (BAL) describes the component specified on the cover only. The manual does not include details about the interaction of this component with other components within a system.

For information relating to the system please read the system and project documentation. Follow these instructions during any work on the system or operation of the system.

All given values are based on the metric system. Given dimensions without any measuring unit are generally in millimeters (mm).

2 Symbols and hints

Warning of voltage

This symbol can be found in several places in the operating instructions where special care has to be taken due to a voltage presence which is hazardous to people. Please observe these instructions and be careful in those cases. Please apply all health and safety regulations to other users as well. Always disconnect the system from the main supply prior to carrying out any work on the energy supply system.

Attention - some hints

This sign draws the attention to parts of the operating instructions where the regulations, advice and correct operational sequence must be observed to avoid any damage or destruction to the energy supply system and its components.

Temperature

This sign draws the attention to parts of the operating instructions, where special care must be taken because of hot surfaces or where inductive heating of ferromagnetic material may occur and where special measures have to be taken.

Please pass on the advice to other users as well.

3 Advisory information for the user

When the Track Supply is open it can contain live voltage and hot surfaces, depending on its protection class and state of operation.

Non-permissible removal of required covers, improper operation, faulty installation or operation involve risk of severe injuries to a person and damage to components.

The Track Supply has a weight of approx. 56 kg and must not be lifted or moved by an individual person. To move and position it use only suitable equipment and follow the according instructions (see chapter 6 “Technical data”).

All electric installation and commissioning work as well as repair work and disassembly have to be carried out by qualified staff (IEC 364 respectively CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN VDE 0110 and national safety rules).
All installation and commissioning work as well as repair work and disassembly have to be done according to the present operation manual. The specifications of this document have to be strictly observed. In addition, national regulations and whenever they apply regulations specific to the industry are to be taken into account.

Qualified staff, according to the safety regulations, are persons who are familiar with the installation, assembly, commissioning and operation of the energy supply system and who have the appropriate qualifications.

Conductix-Wampfler GmbH cannot be responsible for damage or breakdowns that have been caused by not observing the instruction manual.

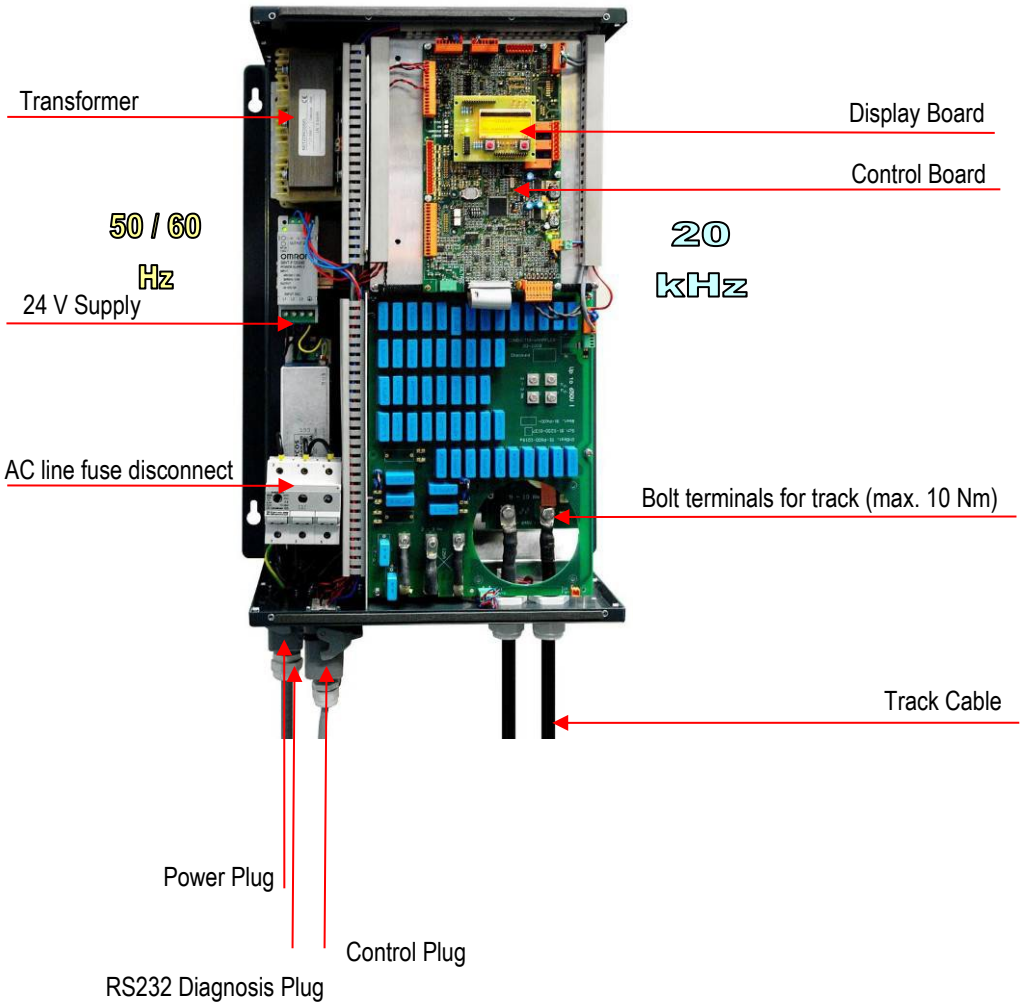
These operating instructions contain exclusively details of the Track Supply component.

We reserve the right to carry out technical modifications of illustrations and statements in this instruction manual. References to other documents specifying the document number do not include the revision index. Refer to the project handbook for a list of relevant documents.

4 Brief technical description

The Track Supply serves to supply energy to the secondary components of the system in a defined segment. The Track Supply converts the 400 V 50 Hz or 480/277 V 60 Hz mains voltage to a constant 20 kHz sinusoidal current. The alternating output current into the primary track of a system produces a local magnetic field over which power is transferred. So the galvanically isolated power transfer to the consumers is possible (e.g. to the pickups).

5 Appearance



View without front lid

Note that the picture above may not in some cases correspond exactly to the delivered component (for example color or wiring positions). If you have concerns you have not been delivered the correct item please contact a Conductix-Wampfler representative.

6 Technical data

6.1 Electrical data - specifications

6.1.1 Electrical output data – specifications for 400 V and 480 V versions

- Continuous output power: 6 kW
- Overload capability: 137% (8 kW) for max. 1 minute / 10 minute at 40°C, with average load derating to 4.9kW
- Output current: 80 A or 125 A ± 2A @ 20 kHz ± 50 Hz
- Optimal load track inductance: 58 µH ±2 µH for 80 A Track Supplies; 26 µH ±2 µH for 125 A Track Supplies
- Nominal output voltage range: 560 - 665 V rms (80 A), 380 - 475 V rms (125 A). Overloads will increase the voltage.
- Impedance output to PE: 180 Ohm (center capacitively referenced)
- Connection to primary cable: Stainless Steel M8 bolts for 35 mm² and 20 mm² HF Litz cables. Torque range 9-10 Nm.

6.1.2 Electrical input data – specifications for 400 V versions

- Input nominal supply voltage: 400 V / 50 Hz, 3-phase symmetric, neutral grounded
- Supply voltage tolerance: -10% to + 10%, with proportional cont. power de-rating for input voltages other than nominal value
- Efficiency at rated load: 94%
- Power factor (cos φ): 0.78
- Supply current: 12 A at rated power / voltage
- Input connector: Supplied HAN-6HSB in Han-16B connector with PG 21 or M25 cable gland. Maximum outside cable diameter is 18 mm. Use flexible cable 6 mm^2.
- Input leakage current: 16 mA rms in standby. Occasional 200 mA peak pulses for 250 µsec at rated load. Ground leakage equipment must be rated accordingly if used.
- Internal fuses: 16 A gS or gRL. Semiconductor and wiring protection.
- Harmonic currents (rated load): 5th -4.5dB, 7th -9dB, 11th -21.6dB, 13th -21.7dB (on fundamental)

6.1.3 Electrical input data – specifications for 480 V versions

- Input nominal supply voltage — 480 V / 60 Hz, 3-phase symmetric, neutral grounded
- Supply voltage tolerance — -10% to + 10%, with proportional cont. power de-rating for input voltages other than nominal value
- Efficiency at rated load — 94%
- Power factor (cos φ) — 0.78
- Supply current — 10 A at rated power / voltage
- Input connector — Supplied HAN-6HSB in Han-16B connector with PG 21 or M25 cable gland. Maximum outside cable diameter is 18 mm. Use flexible cable 6 mm^2.
- Input leakage current — 19 mA rms in standby. Occasional 200 mA peak pulses for 250 µsec at rated load. Ground leakage equipment must be rated accordingly if used.
- Internal fuses — 12A JKS, HSJ, DFJ Fast Class J
- Harmonic current (rated load) — 5th -4.3dB, 7th -9.1dB, 11th -18.7dB, 13th -19.7dB (on fundamental)

6.2 Physical data

- Noise levels — During operation 65 dBA at 1m distance in front
- Air volume moved — 50 m^3 / hour (air recirculation)
- Fan — 3 axial fans

6.3 Environmental data

- Ambient temperature: +5°C to +40°C, power de-rating 3% / °C between 40°C and 55°C
- Humidity: < 90% non-condensing
- Ambient air: No salt water, no conductive dry or wet dust! (e.g. carbon fibers). Avoid extreme environment conditions (e.g. very dusty, Oily and/or chemical influences)!
- Altitude de-rating: 1% of power / 100 m above 1000 m, up to a max. of 3000 m above sea level
- IP classification: IP 20 (limited by exhaust vents on top and other ventilation openings)
- Pollution Degree: PD = 2. Non conducting pollution present, that may become temporarily conducting if moisture is present after switching off.
- Storage temperature: -20°C to +60°C
- Transport temperature: -20°C to +70°C
- Maximum Vibration: 3 mm at 2 - 9 Hz, max. acceleration 0,5 g at 9 - 200 Hz
- Maximum operating shock: 8 g, 11 ms
- Maximum shipping shock: 15 g, 11 ms in packaging / transport box

The Track Supply requires for correct cooling a sufficient air flow. Ensure free air flow at all times and if Track Supply is mounted in a cabinet inspect filters for dust and oil blockage regularly.

Shielded control cables are not strictly required but to improve the EMC are recommended.

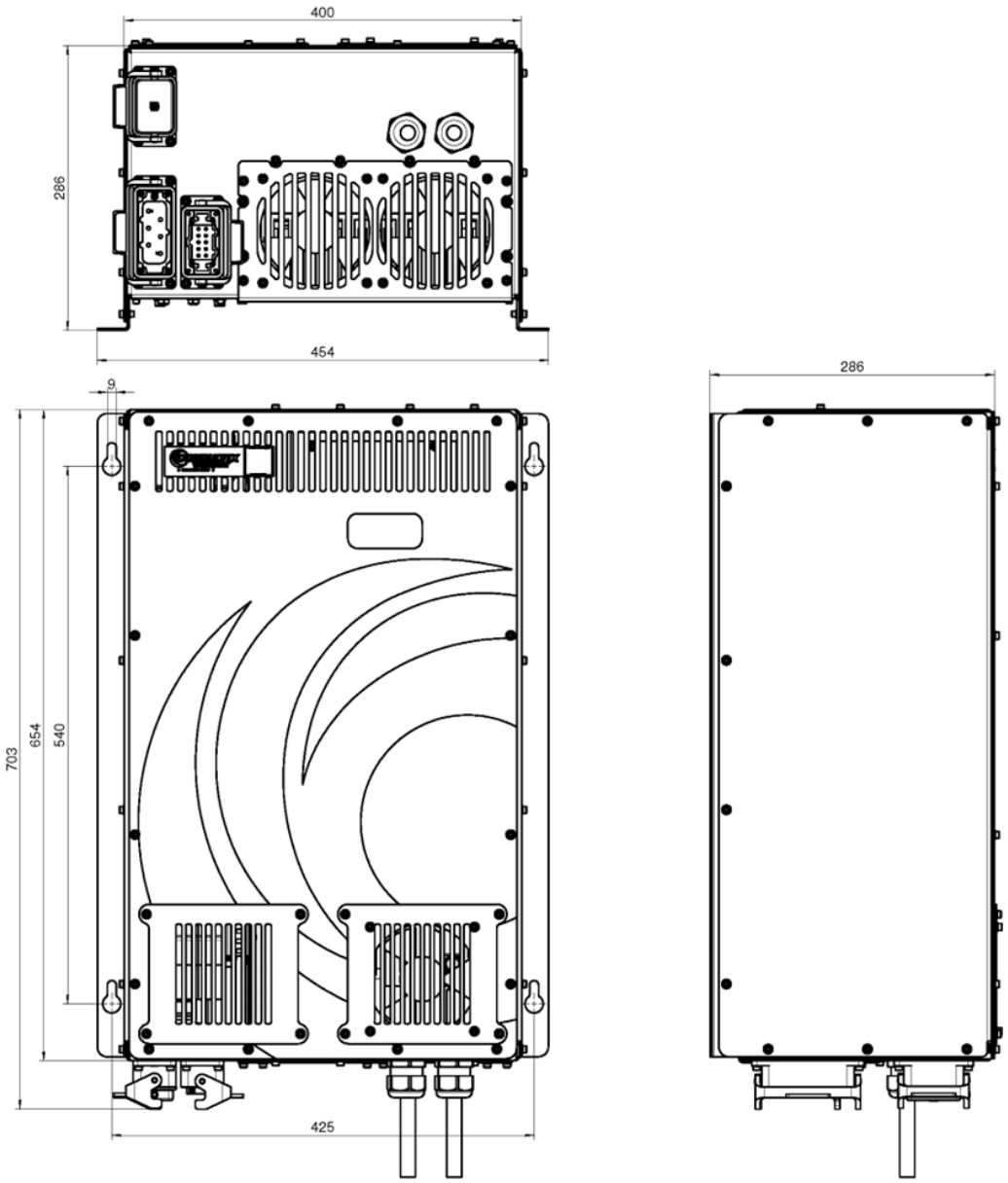
In order to avoid induced voltages at 20 kHz, the control cables and other cables should not be run close to the track cable and especially not over distances > 5 m. Shielded twisted pair cable will help reduce the capacitive coupling effect. The shield should be grounded at one end only.

- Space around cabinet: Sufficient air flow has to be guaranteed!
  Recommended clearances:
  200 mm over the Track Supply
  200 mm in front of the Track Supply
  100 mm sides of the Track Supply

6.4 Mechanical data

- Cabinet — Sheet metal housing
- Dimensions — see the following drawing
- Nom. color housing (outside) — RAL XXXX; delivered color see type plate on Track Supply *
- Weight — ~ 56 kg

Dimensions



* = Colors are configurable prior to production.

6.5 Interfaces

Track connection (X1)

Pin	Function	Remarks
1	Track cable 1	20 (80 A) - 35 (125A) mm² lug HF Litz cable *
2	Track cable 2	

* = cable shoes with M8 hole, Soldered only!

Connection to AC mains supply (X2); Harting HAN-6HSB / Han-16B Housing

Pin	Function	Rating	Remarks
1	L1	12 / 10 A	I depending on load and input voltage
2	L2	12 / 10 A	I depending on load and input voltage
3	L3	12 / 10 A	I depending on load and input voltage
PE	PE		

Control and synchronization (X3); Harting HAN-10E

Pin	Function	Rating	Remarks
1	Start +	24 V	24 V present = start
2	Start -	0 V	
3	/Reset +	24 V	0 V = reset
4	/Reset -	0 V	
5	ErrorRelay	1 A 24 V	Normally closed, open on error
6	Error Relay		
7	24 V supply	100 mA	Not for external distribution!
8	0 V		
9	Synchronization	±15 V	
10	Synchronization		

For more details on X1, X2 and X3 and their connection refer to chapter 10.5 “Electrical connection”.

6.6 General features

- Input line chokes — will drop 4% from the mains voltage at rated load
- EMC filtering — Built in line filter included
- Start-up inrush current — < 10 A
- Mains to output isolation — High frequency isolation transformer
- Internal cooling fans — 3 axial fans

6.7 Design standards

6.7.1 Design standards for 400 V versions

- EN 50178
- EN 61000-6-2
- EN 55011

6.7.2 Additional design standards for 480 V versions

- UL 508A — Standards for Industrial Control Panels

6.8 Safety features of Track Supply

- Over temperature — 4 In-built temperature sensors and switches
- Over load — Output load monitoring
- Over current — Internal current monitoring
- Over voltage — Output voltage monitoring
- Ground fault detection — Level adjustable
- Current sensor failure detect — Detects if track current sensor is not functioning correctly
- Track detuning — Monitors track and detects if the tuning is out of range
- Input line loss — Detects if line phase is missing
- Fuses — Integrated fast fuses
- Input to output isolation — 2500 V AC for 1 min

6.9 Grounding

The Track Supply has to be grounded professionally at the installation place and connected preferably to a symmetrical neutral grounded three-phase WYE supply. Although the Track Supply may well function in supply systems with other grounding, such as grounded delta, the electromagnetic compatibility and reliability may be compromised.

Metal structures which run close and parallel to the primary track cable over significant distances have to be grounded professionally too. For best results multiple grounding should be applied. In order to avoid induced voltages at 20 kHz, the control cables and other cables should not be run close to the track cable and especially not over distances > 5 m. Shielded twisted pair cable will help reduce the capacitive coupling effect, but the shield should be grounded at one end only.

7 Control board hardware and failure indication

7.1 Track Supply Control Board

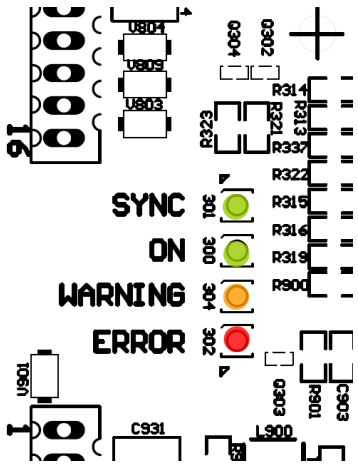
The control board is located in the upper part of the Track Supply and is visible if the door of the cabinet is open.

There are two PCB's:

- **The control board**
- **The display board sitting on top of the control board → refer to section 7.2**

7.1.1 Control board LED indication

The control board LEDs are normally only visible when the door is open and/or the protective covers have been removed.
Therefore these LEDs are intended for advanced error analysis only.
The two green LEDs (V503 and V504) indicate the correct functioning of the on-board power supplies (12 V and 5 V) and should always be on.

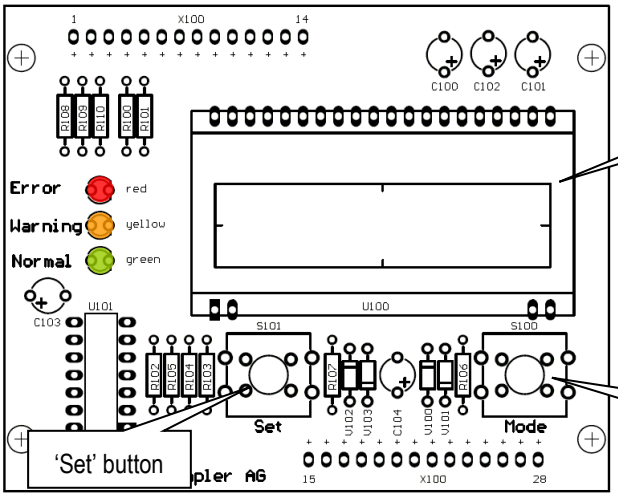


The 4 LEDs on the control board inform the user of the state of operation of the Track Supply:

- **SYNC (green LED)**
- **ON (green LED)**
- **WARNING (yellow LED)**
- **ERROR (red LED)**

The indication of the 'On', 'Warning' and 'Error' LEDs corresponds to the one of the three LEDs located on the Track Supply display board (refer to section 7.2.1).
In addition the 'Sync' LED indicates whether an external 20 kHz synchronization signal is present or not.

7.2 Track Supply Display Board



The Track Supply display board has a backlit 3x16 character display, 3 LEDs and two push buttons for user interaction assembled.

7.2.1 LED indication

The behavior of the three display board LEDs is as follows:

LED green	Status	Cause
Off	Track Supply not powered or error → see red LED	Possible causes: • Track Supply is disconnected from the mains power • Problem with control board
Flashing	Track Supply in standby mode	Normal condition due to absence of START signal on HAN-10E
On	Track Supply is running	Normal condition: START and RESET signals are present on HAN-10E

LED red	Status	Cause
Off	Track Supply not powered or no error → see green LED	Normal condition if there is no error.
Flashing	Track Supply in reset mode	Normal condition due to absence of RESET signal on HAN-10E
On	Track Supply error → see yellow LED / LCD	See display for error code. Error codes are described in section 7.2.6 below.

The yellow LED warns the user of critical operating conditions. No warning will stop operation of the Track Supply, however, a persistent warning may subsequently lead to an error if left unattended. If more than warning is present at a time, only the most

important one will be shown (in the table below importance increases from top to bottom). Example: if tuning and overload warning both are present, the warning LED will be on. The LCD, however, will display both warnings (see section 7.2.5).

LED yellow	Status	Cause
○ Off	No warnings	
☼ 1 brief flash every 2 s	Real Time Clock warning	Real Time Clock has stopped due to weak battery and may be out of date. Track Supply will continue to operate, however, errors will no longer be time stamped correctly.
☼ 2 brief flashes every 2 s	Tuning warning	Track inductance is too low or too high. Track Supply can continue to operate, however, an over temperature condition may result. Causes: • Incorrect commissioning • Pickups added after commissioning • Damaged track tuning capacitors • Track/ Feeds repositioned or lengthened
☼ Flashing slowly	Over temperature warning	One or more of the following causes: • Air intake or exhaust blocked • Fan(s) blocked by dust or defect • Heat sink blocked by dust • Overloading, too many loads • Ambient temperature too high Track Supply will continue to operate, however, an over temperature condition may result.
● On	Overload warning	Too many loads on track. Track Supply will continue to operate, however, an over temperature, over current or over voltage condition may result.

7.2.2 Software Version Number

After powering up the LCD displays for 5 seconds a welcome screen with software revision number and compilation time and date.
The Track Supply may start operation prior to the expiry of 5 s delay depending on the START input.

```
Version 1234567a
13:07
17-Mai-09
```

7.2.3 Modes of Operation

During operation the LCD provides basic information about the operating mode of the Track Supply. The following modes have been defined:

The Track Supply is powered but does not receive a high level signal on its RESET input. Output is disabled.

```
-----RESET------

No warnings
```

The Track Supply is powered but does not receive a high level signal on the START input. Output is disabled.

```
----STANDBY-----

No warnings
```

The Track Supply is operating normally.

```
------RUN-------

No warnings
```

The Track Supply detected an error. Error code with time and date of occurrence are displayed. Refer to section 7.2.6 below for details on error codes
Output is disabled.

```
-----ERROR------
E001        15:01
          26.05.09
```

7.2.4 Setting Language, Time and Date

There are two buttons located beneath the LCD that allow the user to change basic settings. Settings may be changed in any mode, except in RESET mode. If the RESET mode is entered (RESET input low) while settings are being changed, any changes made are lost!

To start changing settings, the MODE key must be held down for 5 seconds. Once this delay has expired the right hand screen will be displayed. Subsequent presses of the SET key will step through the four available display languages:

```
SELECT LANGUAGE
English
```

- English
- German
- French
- Italian

Pressing the MODE key will advance to the next setting screen shown below.

The time setting is displayed in 24 h hh:mm format. The keys function as follows:

- Pressing or holding the SET key will increase the setting marked by the cursor.
- Pressing the MODE key will advance the cursor to the minute setting or the next screen respectively.

```
SET TIME
15:01
hh:mm
```

The date is displayed in dd.mm.yy format. The keys function as follows:

- Pressing or holding the SET key will increase the setting marked by the cursor.
- Pressing the MODE key will advance the cursor to the next setting or the next screen respectively.

```
SET DATE
26:05.09
dd:mm:yy
```

If any changes were made, the user is prompted to confirm or discard these.

- Pressing the MODE key will discard any changes.

```
     SAVE ?

Yes           No
```

- Pressing the SET key will save the new settings, which is confirmed by the right hand screen.

```
Settings saved!
```

7.2.5 Warning Messages

While in modes RESET, STANDBY and RUN, additional warning messages may be displayed. These are reflected in the indication of the yellow LED. If more than one warning is present at a time, warning messages will alternate every second. The following warning messages are available:

- No warnings
- Warning Over load (Overload)
- Warning Over Temperature (Overtemp)
- Warning Tuning
- Warning RTC

Refer to section 7.2.1 for a detailed description and possible causes.

7.2.6 Error Codes

Note that one and the same problem can lead to different error codes, depending on the time of occurrence. This is because the error detection methods and reaction times differ for each type of error and also due to the mainly sequential processing by the microprocessor. Once an error is detected, subsequent errors are ignored.

Error code	Description	Meaning/Cause
E001	Phase loss	• Input line phase missing or weak • Blown line fuse(s) • Fuse receptacle is not shut or screwed down properly
E002	IGBT error	• IGBT or IGBT driver board defective • EMC disturbance • 400 V TS used on 480 V supply
E003	Internal current hardware limit	• High peak load • Track is open circuited • Track is detuned

Error code	Description	Meaning/Cause
E004	Ground fault	• Isolation of Track Supply or track installation damaged. • Water present on track • Ground fault level set too low.
E005	Door open	• Pins 11 and 12 of X104 not bridged • Loose connection
E006	No track current	• Track current sensor defect or wire broken
E007	Temperature high on sensor 1	• Air intake or exhaust blocked • Overloading, too many loads • Ambient temperature too high • Damaged track tuning capacitors • Axial fan defect / Fan fuse blown
E008	Temperature high on sensor 2	See E007
E009	Temperature sensor 1 defect	• Defect sensor • Loose connection
E010	Temperature sensor 2 defect	• Defect sensor • Loose connection
E011	Temperature high on heat sink sensor 1	See E007
E012	Temperature high on heat sink sensor 2	See E007
E013	Heat sink temperature sensor 1 short circuited	• Temperature sensor wiring problem
E014	Heat sink temperature sensor 1 open circuited	• Temperature sensor wiring problem
E015	Heat sink temperature sensor 2 short circuited	• Temperature sensor wiring problem
E016	Heat sink temperature sensor 2 open circuited	• Temperature sensor wiring problem
E017	Temperature switch 1 open circuited	• Loose connection • See E007
E018	Temperature switch 2 open circuited	• Loose connection • See E007
E019	LCD	• LCD defect • Loose connection between display and control boards
E020	Output (Track) voltage high	• Track is detuned
E021	Output (Track) current high	• Control board failure
E022	Output power high	• Too many pickup loads on track
E023	Soft-start error	• Soft-start circuit failure
E024	Watchdog	• Software problem
E025	Brownout	• Control board supply voltage failure • Control board on-board power supply failure

E026	Track Supply output open circuited	• Track not connected • Track cable damaged or cut
E027	DC bus voltage high	• Mains overvoltage, e.g. lightning or other disturbance
E028	DC bus voltage low	• Phase of mains supply missing, e.g. fuse blown • Weak mains supply
E029	Internal current software limit	• High peak load • Track is open circuited • Track is detuned
E030	DC bus voltage unstable	• At power up no stable DC bus voltage could be detected due to a mains supply disturbance
E031	Inductance high	• Track tuning capacitor aging, failure or loose connection inside capacitor box • Incorrect commissioning • Pickups added after commissioning • Track/ Feeds repositioned or lengthened after commissioning
E032	Inductance low	• Track tuning capacitor aging, failure or loose connection inside capacitor box • Incorrect commissioning • Pickups added after commissioning • Track/ Feeds repositioned or lengthened after commissioning
E033	3.3 V on board power supply failure	• Communication power supply overload/failure
E034	3.3 V on board power supply failure	• Micro power supply overload/failure
E035	3.3 V on board power supply failure	• Analog power supply overload/failure
E036	3.3 V on board power supply failure	• FPGA power supply overload/failure
E037	5 V on board power supply failure	• 5 V power supply overload/failure
E038	24 V control board supply failure	• 24 V power supply overload/failure • 24 V on external Han 10 being used inappropriately
E039	FPGA configuration error	• FPGA failure • Flash memory failure • SPI bus problem
E040	FPGA SPI bus error	• SPI bus problem
E041	Invalid output voltage measurement	• FPGA failure
E042	Invalid output current measurement	• FPGA failure
E043	Invalid internal current measurement	• FPGA failure
E044	Oscillator error	• Micro oscillator failure
E045	FPGA software error	• Software not compatible
E046	Zone controller 1 error	• Zone controller fault report (external)
E047	Zone controller 2 error	• Zone controller fault report (external)
E048	DIP switcher	• Wrong DIP-switch setting
E049	Output peak power high	• See E022; to many loads on the track or power demand to high

8 Fuses

Used fuses see chapter 20.

Attention: The Track Supply is without any voltage inside only when the plug or the power supply is disconnected for at least 20 minutes. After 10 minutes however, the internal voltages on the dc bus capacitors has dropped to < 60 VDC.

Line fuses

For checking and changing of the main fuses please follow these instructions:

- Disconnect the Track Supply from the mains voltage and protect it against re-start or switching on!
- **Before** opening the Track Supply please wait at least 10 minutes for internal discharging to < 60 VDC!
- Remove left hand fuse cover on lid!
- After removal check the condition of the fuses!
- If fuses needed changing change all 3 fuses together! Use only those specified. See chapter 20.
- Ensure fuses are properly seated, and receptacle is fully closed.
- Replace the cover and bring Track Supply in operational state!
- Connect the Track Supply to the mains voltage and re-start!

9 Transport and storage

The transport company must be advised about any damage that has been detected after delivery. Prior to installing or starting operation of damaged components please consult the supplier.

The Track Supply must only be moved, lifted or carried by suitable lifting and transport equipment (Weight see chapter 6.4 “Mechanical data”). When using a forklift or similar transport equipment take care not to damage the cabinet. Follow the instructions of your lifting gear to lift correctly and safely. Pay attention to the respective equipment operating instructions for lifting and transport.

Regarding storage conditions please see chapter 6.3 “Environmental data”.

10 Installation

10.1 Who is authorized to carry out the installation?

All installation and commissioning work as well as maintenance work and disassembly have to be carried out by qualified staff (IEC 364 respectively CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN VDE 0110 and national safety rules).

All installation and commissioning work have to be done according to the present operation manual. The specifications of this document have to be strictly observed. In addition, national regulations and whenever they apply regulations specific to the industry are to be taken into account.

Qualified staff according to the safety regulations are persons who are familiar with the assembly and installation of the energy supply system and who have the appropriate qualifications.

10.2 General advice for the installation

- After receipt of the component(s) and prior to starting the installation work, unpack the component(s) and check carefully for damage that may have occurred during transport or storage (damage to housings and insulation, missing parts etc.).
- Check data on the identification plate to make sure that the component(s) meet the requirements with regard to nominal power and voltage.
- Check completeness of the documents and conformity with the delivered component(s).
- When operating several track supplies in one plant the control board may need to be synchronized. Conductix-Wampfler provides documentation with the synchronization components.

For the installation of the Track Supply make sure that it is mounted safely. It has to be secured on site so that the position of the Track Supply will be permanently safe!

An improper installation of the energy supply system has a negative effect on its function, efficiency and lifetime. It is therefore important to observe the specification for the choice of the place of installation. The guarantee will expire if this is not observed!

10.3 Place and conditions of installation

Always install the Track Supply in a dry and ventilated room. The Track Supply has to be mounted in a vertical position and attached to a solid wall construction.

The heat loss of the Track Supply is mainly ventilated out of the housing by forced convection cooling. It is therefore essential to make sure during the mounting that the air flow is not hindered in any way by objects near the inlet or outlet of the housing.

The ambient temperature should not be lower that 5°C and must not exceed the Conductix-Wampfler specification of 40°C. The relative air humidity should be below 90% and there must not be any condensation. Avoid negative influences of the environment.
Operation outside of these conditions can cause changes of the power parameters. (Take notice of the chapter 6 “Technical data”.)

In case the Track Supply is installed in a cabinet or small room, a sufficient air flow must be ensured. The temperature inside the cabinet shall not exceed
40°C. Install filters and/or air-conditioning in order to meet the necessary IP protection classification.

The climatic conditions for storage and operation according to the specifications have to be observed - see chapter 6.3 “Environmental data”.

A distance of 200 mm between the sides of the Track Supply to walls and other cabinets is recommended for maximum performance, especially if neighboring equipment is also generating heat.

10.4 Electrical regulations

The general electrical operating conditions according to VDE 0100 (installation and operation of electrical equipment up to 1000 V) have to be observed. If necessary observe the local regulations when they go beyond these requirements.
The internal fuses in the Track Supply are for limiting damage within the Track Supply in the event of a component failure.
Appropriate protection should be given to the three-phase supply cable according to local regulations.

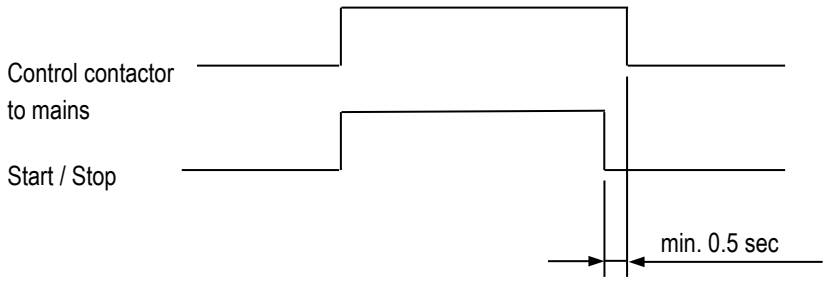
10.5 Electrical connection

10.5.1 Mains connection

The power cables of the supply lines L1, L2, L3 and PE have to be chosen as follows:

1. Use only applicable cables that are approved according to VDE, UL or CUL.
2. The Track Supply is designed for connection to a neutral grounded 3-phase supply system. While operation on alternative supply systems such as corner grounded Delta maybe possible, it is unadvisable and may void the warranty. Please discuss with Conductix-Wampfler if in doubt.
3. The nominal voltage of the cables for systems of 480 V AC must be at least 600 V.
4. The core cross-section has to be planned according to the relevant standards but recommended at least 2.5 mm².
5. Grounding is to be realized according to VDE, NEC and IEC (see chapter 6.9 “Grounding”).
6. The 3-phase input supply connection to X2 requires a flexible stranded core type cable for connection to the supplied Harting connector. Maximum cable outer diameter is 18 mm with supplied PG 21 / M25 cable gland.

Attention!
To avoid damaging the input fuses we recommend that the 3-phase mains supply shall be only removed when the START / STOP-signal is in the “STOP” position. A delay of at least 0.5 seconds is recommended!



10.5.2 Configuration of control plug

Inputs:

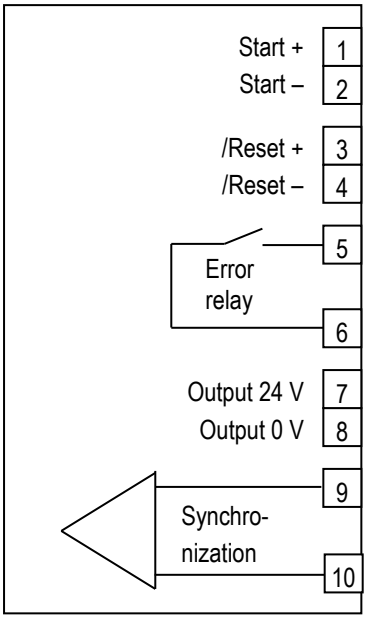
/Reset	Reset+ (Pin 3) must be taken 24 V DC above Reset - (Pin 4), otherwise the Track Supply remains in a reset state. Note to reset the Track Supply the Reset must go low for at least 0.5 seconds.
Start	24 V DC and GND may be supplied to turn the Track Supply on or off. If Start+ (Pin 1) is taken 24 V DC above Start- (Pin 2) the Track Supply output is energized. Otherwise the outputs are disabled.
Sync	For synchronizing track supplies together to the same frequency and phase. Use only Conductix-Wampfler approved equipment. When using several track supplies synchronization may be required.

Both Start and /Reset inputs are optically isolated and may be connected to an external 24 V DC supply or the provided 24 V output.

Outputs:

Error	Switch is open on error or if the mains supply is disconnected. Otherwise it is closed.
0 and 24 V	May be used for control and commissioning, but must not be distributed over cables longer than 2 m.

Reference for input and output:

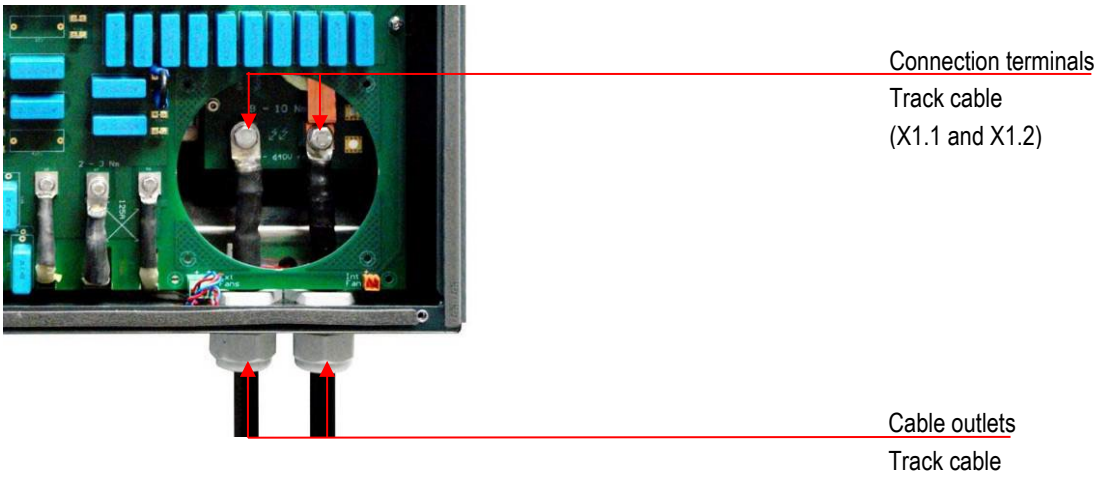


Harting HAN-10E

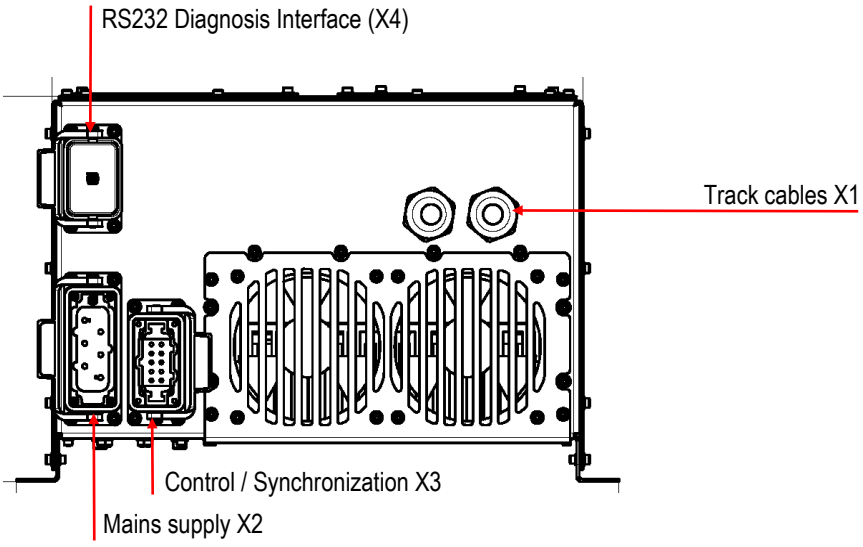
Do not locally distribute this 24 V DC supply output over control cables! Do not reference 0 V to other potentials!

10.5.3 Connection track cable (X1)

Torque for the track cable connections X1.1 and X1.2: 9 - 10 Nm.



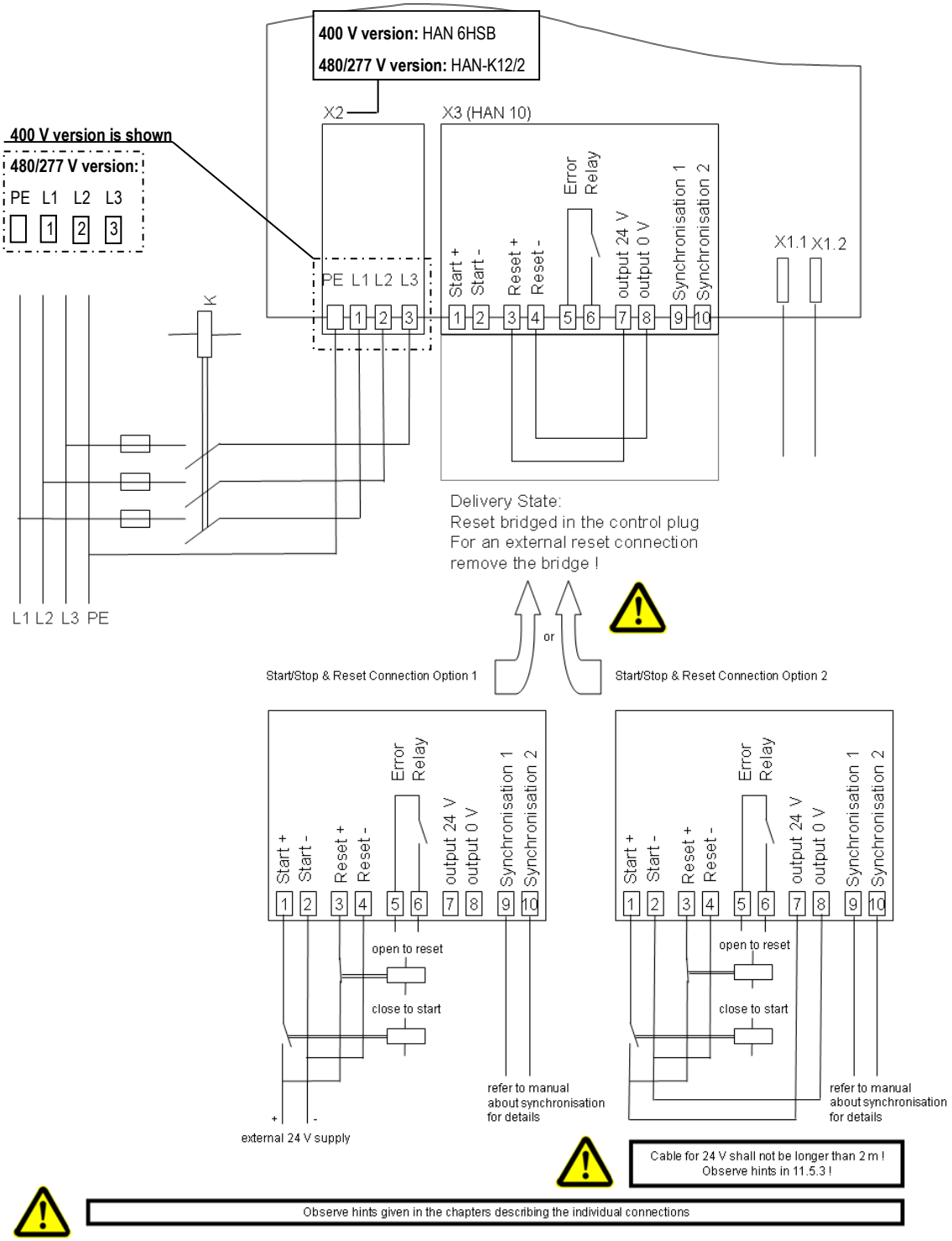
10.5.4 Arrangement external connections (X2, X3, X4)



Cabinet underneath

Hint: Pay attention to leaving cable ends long enough to make connections. We recommend use of a highly flexible cable!

10.5.5 Wiring of the Track Supply



10.5.6 Wiring of the Track Supply

Attention: The Track Supply is without any voltage > 60 VDC inside only when the plug or the power supply is disconnected for longer than 10 minutes. For absolute safety please wait 20 minutes.

Observe safety precautions and make sure no others do have access to the opened Track Supply!

To get better access to the internal components, the side lid and the front lids can be removed

For ease and quickness of access to the fuses and the Track Cable connections the specific covers in the front lid may be removed

Example shown: connection of Track Cable through opening on the right side. Use a tightening Torque of 9-10 Nm on the stainless steel M8 bolts. Fuses behind the left hand cover.

11 Warnings and cautions

All electric works have to be carried out by qualified staff (IEC 364 respectively CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN VDE 0110 and national safety rules).
All installation and commissioning work as well as repair work and disassembly have to be done according to the present operation manual. The specifications of this document have to be strictly observed. In addition, national regulations and whenever they apply regulations specific to the industry are to be taken into account.

Qualified staff according to the safety regulations are persons who are familiar with the installation, commissioning and operation of the energy supply systems and who have the appropriate qualifications.

The Track Supply is only foreseen to be operated in conjunction with matching components. If you are not sure whether components match, contact Conductix-Wampfler. Do not put into operation beforehand.

Operation of the Track Supply without all provided covers may allow the ingress of dirt and dust, thereby reducing the ability to function reliably and within specification. Avoid operation with removed cover(s) and / or opened door.

Tighten all cable glands at the bottom of the inner enclosure and ensure that the covers are screwed down properly!

Although the Track Supply output is isolated from the mains supply by a transformer, the 20 kHz high frequency output is Protective Earth referenced by Y-connected noise suppressing capacitors. This means a potential voltage exists with respect to PE that could cause electric shock and even death in some people.

Avoid coming into contact with any uninsulated part of the primary supply. Don’t touch electrical components in the Track Supply.

DANGER OF LIFE MUST BE AVOIDED BY IMPLEMENTING SUITABLE PROTECTION MEASURES!

Observe safety pre-cautions before and while removing any covers and housings!

12 Commissioning

Prior to commissioning pay attention to warnings and hints in chapter 11 "Warnings and cautions".

Track supplies have to be commissioned in conjunction with other corresponding Rail components. For commissioning it is thus necessary to have the secondary components installed on the vehicles. Access to the secondary side pickups and power regulators on vehicles is necessary.

The primary system has to be installed completely before commissioning. Commissioning on site requires adjustment of the primary track cable impedance that the Track Supply is connected to. The general operation of the inductive energy supply, with regard to the required resonant conditions of the system, is adjusted to the local conditions by means of capacitors and inductors.

These adjustments at the Track Supply must be done only by trained personnel.

During commissioning work the dangerous work zone has to be provided with warning signs and secured with a shutoff tape against entry by unauthorized persons to the site or touching of current-carrying parts.

Requirements for the commissioning:

- Entrance to the site without any problems.
- Free access to the power supply without any difficulties.
- Free access to all components.
- Safe storage for all needed tools (components, tools, measurement equipment, utilities etc.)
- Possibility to remove or to short-out pickup(s).
- Possibility to increase the load on the pickup(s) / power regulator(s) step by step.
- Access to external control signals to the Track Supply.

Any changes to the system (e.g. more vehicles) or in the environment after the commissioning requires an additional commissioning.

12.1 System conditions

The permissible transient fluctuation of the system voltage is between -10% and +10% of the nominal voltage. If the values are lower or higher than these, the technical specifications of the Track Supply cannot be guaranteed any longer and destruction of some components may be the consequence.

12.2 System protection

The user must install fuses or overload disconnectors in the power input line according to the relevant regulations of the NEC and all local regulations. The operation level must be coordinated with the internal fusing of the Track Supply and expected loading.

13 Start and operation

The Track Supply is not designed for independent operation. It has to be operated in conjunction with corresponding rail components. Therefore no specific details about the operation are given in this document.

Prior to switching-on the Track Supply ensure that the installation and commissioning were executed correctly. Always attend to the valid safety regulations!

After connecting the Track Supply to the line voltage the components of the power circuit are connected to the voltage network. Do not touch these components. **DANGER OF LIFE!** It is therefore obligatory to keep all doors and covers CLOSED.

Start-Sequence (remote operation):

1. If there is an external isolator switch between the main distribution and Track Supply switch it on.
2. Switch-on the Track Supply - “ON” on the START-input.
3. On the display board the green “ON” LED is on.
4. The System is now on.

Prior to any intervention into an electrical or mechanical component of the energy supply system the complete system always has to be disconnected from the supply voltage!

Connecting and disconnecting measuring instruments is only allowed under off-circuit conditions and must only be carried out by trained personnel.

Reconstruction or modifications at the energy supply system or its components on one’s own authority are excluded from the guarantee.

Any necessary reconstructions or modifications - especially on electrical components - are only allowed if they have been approved by Conductix-Wampfler.

14 Switching-off

As described earlier (see chapter 10.5 “Electrical connection”): first switch-off the Track Supply by switching the START-input to “OFF” and after this disconnect the line voltage (i.e. by a load switch).

After disconnection of the energy supply system from the supply voltage, components or power terminals must not be touched immediately afterwards, because capacitors might be charged. After switching off the supply voltage wait 10 minutes (internal voltages < 60 VDC) before starting to work at the energy supply system respectively its components.

Component lifetime may be extended by turning off the Track Supply when the System is not needed, for instance during the night or on weekends.

15 Actions in case of emergency

In the case of smoke inside the cabinet, sparking or danger to personnel or equipment, immediately disconnect the Track Supply from the main supply by first switching off the isolating switch on the door to “OFF”. As a secondary measure disconnect the HAN-6HSB Power Plug.

Unauthorized switching on by a third person has to be prevented by removing the line fuses of the main supply or by other adequate measures on site.

After switching off the supply voltage wait at least 10 minutes (internal voltages are then < 60 VDC) on account of charged capacitors **before** opening the Track Supply and starting the disassembly of the energy supply system.

The dangerous zone has to be provided with warning signs and secured with a shutoff tape against entry by unauthorized people.

16 Fault diagnosis

If the Track Supply faults - e.g. no energy supply to the secondary components, check the LED display for indication of possible cause. Refer section 7 “Control board hardware and failure indication” for LED status.

Attempts to repair or restart should be avoided! Do not use the system anymore as long as the error is not located and repaired or defect components are replaced by trained personal!

After conclusion of the failure analysis, the Track Supply has to be protected against touching of live parts by closed housing / covers. (See Safety hints in chapter 10.2 „General advice for the installation“).

Failure indication on the outside

LCD Display Window

Status lights on Display Board:

Green	: Mains connected	
Yellow	: Warning	In operation, but conditions critical
Red	: Fault	Stopped due to faulty conditions

For advanced status analysis see chapter 7 “Control board hardware and failure indication”.

17 Maintenance

All disassembly work has to be carried out by qualified staff (IEC 364 respectively. CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN VDE 0110 and national safety rules).
Qualified staff according to the safety regulations are a persons who are familiar with the installation, assembly, commissioning and operation of the energy supply system and who have the appropriate qualifications.
All maintenance/repair work have to be done according to the present operation manual. The specifications of this document have to be strictly observed. In addition, national regulations and whenever they apply regulations specific to the industry are to be taken into account.

Attention: Prior to starting maintenance work disconnect the Track Supply from the main supply!
During maintenance and repair work the Track Supply must be secured against unexpected and unintended turn on.

The following maintenance work should be carried out at regular quarterly intervals:

- Look for visible damage outside and check for any sign of damage due to the ambient conditions (i.e. damage to the enclosures and covers due to spraying water, oil etc.).
- Check that free in-coming and out-coming airflow is ensured. Verify that the air supply and the air outlets of the Track Supply are not blocked by any objects.
- Ensure the Track Supply is dry, clean and dust and oil free. If the Track Supply is obviously very dirty reconsider the IP protection and contact Conductix-Wampfler for cleaning advice.

The following maintenance work should be carried out at regular yearly intervals. If operating conditions are heavy and ambient is not clean shorter intervals must be chosen, recommendation is every 6 months at maximum.

- Consult Conductix-Wampfler to have qualified personnel check the operating parameters of the System. Have them compare measured values in the system with those obtained during commissioning or during the last system check. Have them check free air flow inside the cabinet and specific torques.

Warning: After having completed the maintenance work attach enclosure covers before restarting the operation of the system. Improper attachment of the housing cover can cause severe injuries to persons or damage to components.

18 Repair

If repair action or replacement of faulty parts is necessary and possible on site these works have to be carried out by trained personnel or by a Conductix-Wampfler technician, both while considering the relevant safety regulations. If no failure analysis or repair is possible on site the faulty part has to be sent to Conductix-Wampfler GmbH. Please inform our service department in this case for details.

To decide which procedure is the best in your case please inform us of the following:

- Product designation
- Material number
- Serial number
- Configuration details (in case)
- Line data (technical and line-specific)
- Wiring scheme of the line / unit (if available)
- Pictures / photos (if available)
- Failure description or details about the malfunction
- Presumption for the failure analysis

The general and local safety regulations have to be observed (see chapter 10 “Installation” and chapter 11 “Warnings and cautions”).

19 Disassembly / Re-use

If it is necessary to exchange the Track Supply due to damage or to install it in another place, verify that no damage can occur during disassembly.

For installation in another place observe the described mounting and commissioning instructions. Improper application, wrong installation or operation involves the risk of severe injuries to persons and damage to components and equipment.

All electrical work has to be carried out by qualified staff (IEC 364 respectively. CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN VDE 0110 and national safety rules).

Qualified staff according to the safety regulations are persons who are familiar with the installation, assembly, commissioning and operation of the energy supply system and who have the appropriate qualifications.

19.1 Safety advice for disassembly and disposal

1. Disconnect unit from the mains voltage!
2. After disconnecting the Track Supply from the supply voltage wait at least 10 minutes for internal discharging to 60 VDC (20 minutes to < 10 VDC) before opening the Track Supply!
3. Dismount the Track Supply!
4. Dispose of components in a specific way.→ Recycling (see chapter 19.2)

19.2 Recycling

The unit contains components that have to be disposed of in a specific way. If it is not used any longer, it needs to be recycled properly.

20 Spare parts

Only the fuses and a few other parts are to be changed by the operator of the plant! All other parts have to be changed or repaired by trained and qualified Conductix-Wampfler personnel.

Designation	Producer Identification	Conductix-Wampfler Mat.-No.	Used quantity	Remarks
Fuse 16 A	SIBA gRL (gS,) in DO1 cartridge, Part Nr. 1002734.16	**3092096**	3	**For 400 V versions only!** Only by qualified personnel
Fuse 12 A	Class J fast, 21 x 57 mm, Bussmann JKS-12 Bussmann DFJ-12	**3092177**	3	**For 480 V versions only!** Only by qualified personnel
Control board G4 progr.	91-P600-0210	**3087293**	1	Only by qualified Conductix-Wampfler personnel
Display board G4 progr.	91-P600-0233	**3087294**	1	Only by qualified Conductix-Wampfler personnel
Spare part fan TS6/16kW front		**3189820**	1	Only by qualified personnel
Spare part fan TS6/16kW bottom		**3189833**	1	Only by qualified personnel

Other on request

21 Tools

Description	Size / specification	Remarks
Open ended or ring spanner wrench	SW 13	Connection track cable (35 mm Litz cable)
Flat Screw driver	5 - 7 mm	Plug HAN-6HSB earth screw
Flat Screw driver	3 - 4 mm	Plug HAN-6HSB and HAN-10E
Hex Allen Key	3 mm	Open covers of Track Supply
Cable end sleeve	2.5 - 6 mm²	Plug HAN-6HSB
Cable end sleeve	0.5 - 2.5 mm²	Plug HAN-10E
Crimper for cable end sleeves	0.5 - 6 mm²	Plug HAN-6HSB and HAN-10E
Crimper	Harting 3100950	For HAN-K12/2 (480/277 V version only!) Cable cross section 4 - 6 mm²
Tool to dismantle the cable	-	-
Cutter	-	-

For the commissioning further tools and measuring instruments are needed.

Adjustments during the commissioning and start-up

Track Supply ____ A _____ V @ _____ Hz **Material-No.: _____**

Serial number .....

Name of the project or line .....

Environmental conditions on the place .....

Following values were measured or adjusted:

Inductance without track tuning / Adjustment (µH) .....

Inductance after track tuning / Adjustment (µH) .....

Output voltage - track (V) .....

Output current (A) .....

Inverter current (A) .....

Input line supply (V) .....

Remarks / Hints:

.....

.....

Recommended date for the next inspection: ……..……..……..……..……..……..

....

Date **Name** **Sign**

Inspection report _____

Track Supply ____ A _____ V @ _____ Hz **Material-No.: _____**

Serial number .....

Name of the project or line .....

Environmental conditions on the place .....

Following values were measured or adjusted:

	Last	Current	O.K.
Inductance without track tuning / Adjustment (µH)	.....	.....	.....
Inductance after track tuning / Adjustment (µH)	.....	.....	.....
Output voltage - track (V)	.....	.....	.....
Output current (A)	.....	.....	.....
Inverter current (A)	.....	.....	.....
Input line supply (V)	.....	.....	.....

Remarks / Hints:

.....

.....

Recommended date for the next inspection: ……..……..……..

State of the Track Supply: Ready for operation

....
Date **Name** **Signature**

Inspection report _____

Track Supply ____ A _____ V @ _____ Hz **Material-No.: _____**

Serial number .....

Name of the project or line .....

Environmental conditions on the place .....

Following values were measured or adjusted:

	Last	Current	O.K.
Inductance without track tuning / Adjustment (µH)	.....	.....	.....
Inductance after track tuning / Adjustment (µH)	.....	.....	.....
Output voltage - track (V)	.....	.....	.....
Output current (A)	.....	.....	.....
Inverter current (A)	.....	.....	.....
Input line supply (V)	.....	.....	.....

Remarks / Hints:

.....

.....

Recommended date for the next inspection: ……..……..……..

State of the Track Supply: Ready for operation

....
Date **Name** **Signature**

Inspection report _____

Track Supply ____ A _____ V @ _____ Hz **Material-No.: _____**

Serial number .....

Name of the project or line .....

Environmental conditions on the place .....

Following values were measured or adjusted:

	Last	Current	O.K.
Inductance without track tuning / Adjustment (µH)	.....	.....	.....
Inductance after track tuning / Adjustment (µH)	.....	.....	.....
Output voltage - track (V)	.....	.....	.....
Output current (A)	.....	.....	.....
Inverter current (A)	.....	.....	.....
Input line supply (V)	.....	.....	.....

Remarks / Hints:

.....

.....

Recommended date for the next inspection: ……..……..……..

State of the Track Supply: Ready for operation

....
Date **Name** **Signature**

Operation Manual

Track Supply 6 kW

80 / 125 A at 400 / 480 V

Conductix-Wampfler GmbH
Rheinstraße 27 + 33
79576 Weil am Rhein - Märkt
Germany

Phone: +49 (0) 7621 662-0
Fax: +49 (0) 7621 662-144
info.de@conductix.com
www.conductix.com

Importer for the United Kingdom:
Conductix-Wampfler Ltd.
1, Michigan Avenue
Salford
M50 2GY
United Kingdom

Phone: +44 161 8480161
Fax: +44 161 8737017
info.uk@conductix.com
www.conductix.com