Operating Instruction

NI-DV Controller

(Original)

EN

BA-ESR_NI-DV 1.0 – 11/2015

NICOTRA Gebhardt

fan|tastic solutions

Contents

1. Revision Index

Table 1-1: Revision Index

Revision	Änderung
BA-ESR_NI-DV 1.0-11/2015	This is a new edition and a translation of the original

2. General

2.1 Product presentation

NI-DV is a range of controllers suitable for regulating the speed of an electric motor in a wide variety of applications.
NI-DV is highly versatile as it can control various motor types, including:

- ACIM – asynchronous induction motors
- PMSM – permanent magnet synchronous motors
- BLDC – brushless DC motors

2.2 General

- Read this manual thoroughly and follow the instructions it contains before taking NI-DV into use.
- This manual contains important information and should be used when installing, connecting and commissioning the NI-DV as well as during maintenance, service and troubleshooting.
- If the instructions contained in this manual are not observed, the liability of the supplier and the warranty shall be voided (see also Section 6. Prohibition on use).
- Technical descriptions, drawings and figures must not be wholly or partly copied or disclosed to third parties without the permission of the manufacturer.
- All rights are reserved if the product is included in patent rights or other form of registration.

2.3 Key to symbols

Particular attention should be paid to the sections in these instructions which are marked with symbols and warnings.

Warning

This symbol is used where there is a risk of severe or fatal personal injury.

Caution

This symbol is used where potentially dangerous situations may result in minor or moderate personal injury. The symbol is also used to warn against unsafe and hazardous conditions.

Note

This symbol is used to indicate important information and in situations which may result in serious damage to equipment and property.

2.4 Ensuring safety before installation

- NI-DV must only be installed by qualified personnel or people who have received appropriate training and have thus become qualified to install the product.
- Qualified personnel have knowledge of the installation practices used and can perform installation in accordance with relevant local and international requirements, laws and regulations.
- Qualified personnel are familiar with the instructions and safety precautions described in this manual.
- NI-DV contains dangerous high voltage when connected to the mains.
- Mains voltage must always be disconnected before any installation, service or maintenance tasks are performed on the product.
- When NI-DV is connected to the mains, there is a risk that the motor could start unintentionally, causing a risk of dangerous situations and personal injuries.

Warning

- Unintentional start during programming, service or maintenance may result in serious injury or damage to equipment and property.
- The motor/fan can be started via an external input signal, Modbus or a connected control panel.
- Before connecting mains voltage to NI-DV, all NI-DV, motor and fan components must be properly fitted.
- Before connecting mains voltage to NI-DV, all openings, covers and cable glands must be properly fitted and closed. Unused cable glands must be replaced with blank glands.
- NI-DV contains capacitors which become charged during operation. These capacitors can remain charged even after the power supply has been cut off. There is a risk of severe personal injury if the connection terminals or wire ends are touched before these capacitors have been completely discharged. The discharge time is about 3 minutes under normal conditions.

2.5. Product use

- NI-DV is especially used in ventilation applications (fans).
- NI-DV can also be used in other applications. If NI-DV is used in applications where it cannot be positioned directly in a flow of air, impaired NI-DV cooling must be taken into account. This can be countered by creating additional ventilation around the product or by reducing performance requirements. See Section 8. Technical specifications.
- NI-DV is an electronic motor controller used to regulate fan speed. NI-DV can be used to control AC asynchronous motors, BLDC motors and PM motors.
- Depending on what is needed, NI-DV is suitable for stand-alone applications or as part of larger systems/machines.
- The product can be used under various environmental conditions. See Section 8. Technical specifications.
- NI-DV can be fitted directly to the frame of the fan motor, thus saving space.

- Motor operation can be regulated by commands from an external controller.
- NI-DV has built-in motor protection.
- NI-DV can be used in domestic and industrial environments and has a built-in EMC filter.
- The NI-DV is developed for use in industry and defined as professional equipment according to EN 61000-3-2:2014, it is not intended for sales to the general public.

2.6. Prohibition on use

- The NI-DV must not be taken into use until the machine or product into which it is incorporated has in its entirety been declared to be in conformity with all relevant national and international regulations.
- The product must not be energised until the entire installation complies with ALL relevant EU directives.

Warning

- The product carries a manufacturer's warranty if installed in accordance with these instructions and applicable installation regulations.
- If the product has been damaged in any way, e.g. during transport, it must be inspected and repaired by authorised personnel before being connected to the power supply.
- If NI-DV is built into machinery with rotating parts, e.g. a ventilation system, transport system, etc., the entire system must comply with the Machinery Directive.

2.7. EMC – Electromagnetic compatibility

- NI-DV has built-in EMC filter.

2.8. Approvals and certifications

Product standard

- In accordance with EN 61800-2 – Adjustable speed electrical power drive systems. Part 2. General requirements

Safety

- In accordance with EN 61800-5-1 – Adjustable speed electrical power drive systems. Part 5. Safety requirements – Electrical, thermal and energy.

EMC – Electromagnetic compatibility

- In accordance with EN 61800-3 (C1 and C3) – Adjustable speed electrical power drive systems. Part 3. EMC requirements and specific test methods.

RoHS compatible

- Contains no hazardous substances according to the RoHS Directive.

2.9. Product programm

- NI-DV is available in four different enclosures, whose size depends on the rated power of the OJ--DV.
- The product programme contains 12 power sizes ranging from 0.55 kW to 15.0 kW, see table 9.
- Enclosures are designated ”H1”…”H5”, where ”H1” is the smallest and ”H5” is the largest.
- All enclosures are made of die-cast aluminium.

Product name	Enclosure	Power	Supply Voltage	Dimensions (w x h x d)
NI-DV-1005	H1	0,55 kW	1 x 230 V	185 × 230,5 × 90 mm
NI-DV-1007	H1	0,75 kW	1 x 230 V	185 × 230,5 × 90 mm
NI-DV-1011	H1	1,1 kW	1 x 230 V	185 × 230,5 × 90 mm
NI-DV-3016	H3	1,6 kW	3 x 400 V	185 × 265,5 × 100 mm
NI-DV-3024	H3	2,4 kW	3 x 400 V	185 × 265,5 × 100 mm
NI-DV-3030	H3	3,0 kW	3 x 400 V	185 × 265,5 × 100 mm
NI-DV-3040	H4	4,0 kW	3 x 400 V	220 × 294 × 107,5 mm
NI-DV-3055	H4	5,5 kW	3 x 400 V	220 × 294 × 107,5 mm
NI-DV-3065	H4	6,5 kW	3 x 400 V	220 × 294 × 107,5 mm
NI-DV-3075	H4	7,5 kW	3 x 400 V	220 × 294 × 107,5 mm
NI-DV-3110	H5	11,0 kW	3 x 400 V	220 × 340 × 117,5 mm
NI-DV-3150	H5	15,0 kW	3 x 400 V	220 × 340 × 117,5 mm

Table 2-1

All 3x400V versions can also be connected to 3x230V. The power output (kW) will, however, be limited to max. 58% (1/√3) of the rated power output at 3x400V.

Caution

With enclosure sizes H3 ... H5, NI-DV operating and motor parameters are set for connection to a supply voltage of 3x400V.
If these types are connected to a 3x230V power supply, operating and motor parameters must therefore be changed for optimum operation.
Motor parameters can be changed by the installer via the hand terminal (OJ-DV Hterm), OJ-Drives-Tool or OJ-DV PCTool. Configuration parameters can only be changed by the manufacturer.

2.10. Rating plate

NI-DV is equipped with a silver-coloured rating plate. See the example in fig. 2-1 and explanation in table 2-2.
Check that the information specified on the rating plate is as expected.

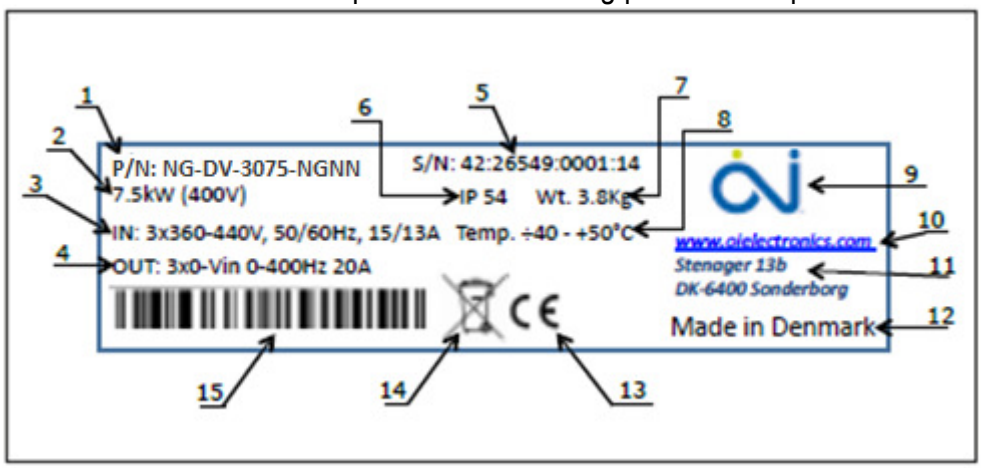

Fig. 2-1: **Rating plate, information and explanation**

1	Product ID = see table 2-4
2	Shaft power at nominal voltage
3	Max. input voltage
4	Max. output voltage/Hz/A
5	Product code = see table 2-3.
6	Enclosure rating
7	Weight
8	Temperature range, operating
9	Manufacturer's logo
10	Manufacturer's web address
11	Manufacturer's postal address
12	Country of manufacture
13	CE approved, logo
14	Disposal, logo
15	Bar code

Table 2-2:

Explanation of product code

Each and every NI-DV is given its own product code during manufacture.
The product code (see table 2-3) gives precise information on the specific NI-DV.
The product code contains the following information:

Week number	Batch	Serial no.	Year
W W	A A A A A	E E E E E	J J
Week of production	Manufacturer's order number	Unit number	Year of manufacture

Table 2-3:

Product-ID

The product ID consists of a combination of 14 numbers and letters, each of which provides information about the specific product, see fig. 2-2 and table 2-4.

1 2	Manufacturer's initials
3	Max. input voltage
4 5	Product type
6	Enclosure rating
7	Weight
8 9 10	Controller power/size
11	Optional module type
12	Cable entry
13	Integrated cooling fan
14	Braking chopper type

Table 2-4:

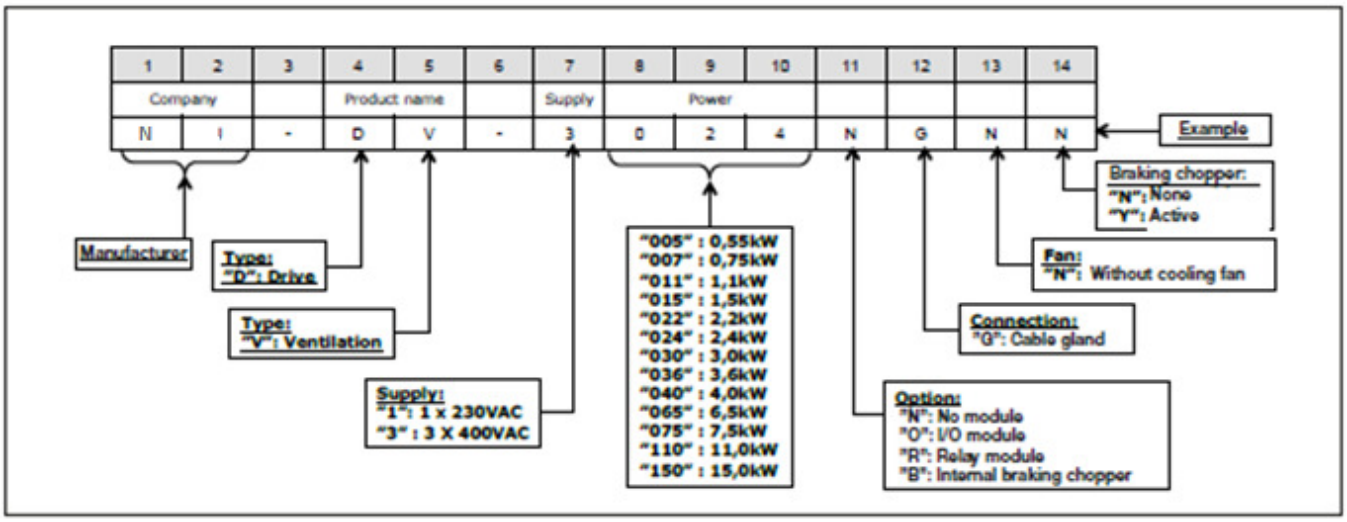

Fig. 2-2:

3. Installation

3.1. Dimensioned drawings

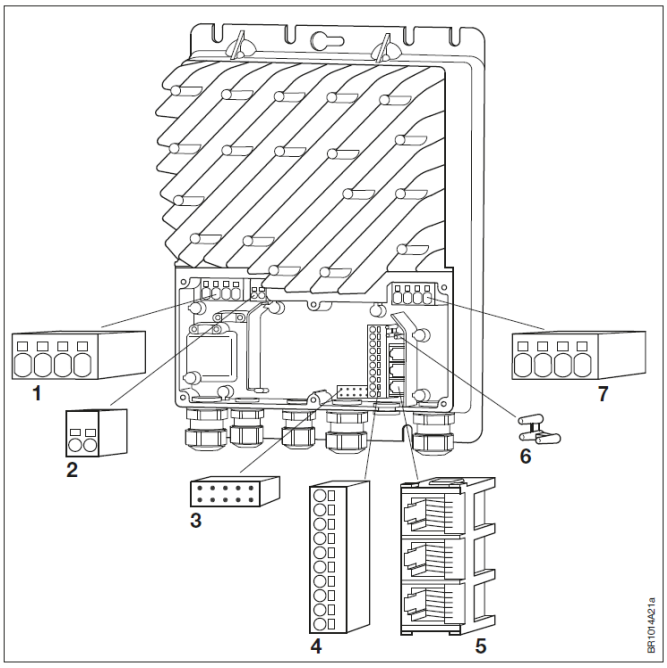

Fig. 3-1:

No.	Description
1	Motor connection terminals (U, V, W, PE)
2	Connection terminals for braking chopper
3	Connector for optional module
4	Terminal strip for Modbus and A/D control signals
5	RJ12 Modbus connector (2 x slave/1 x master)
6	3-point strain relief for Modbus cable (ribbon cable)
7	Power terminals (H1=L, N, PE); (H3, H4, H5=L1, L2, L3, PE)

Table 3-1:

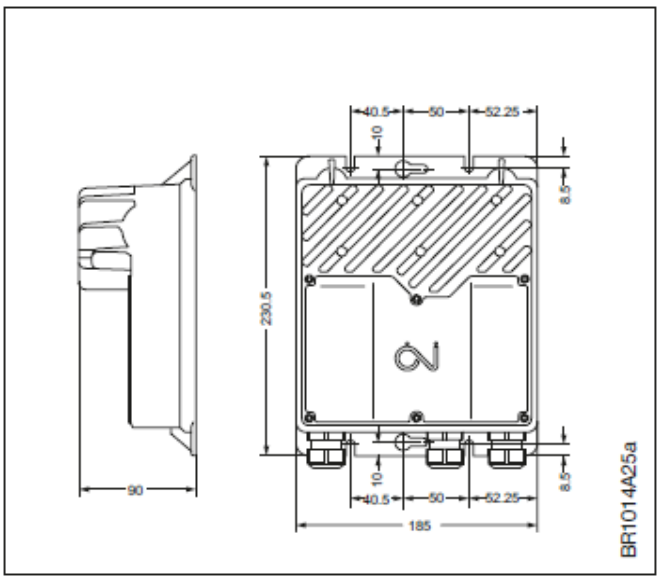

Fig. 3-2:

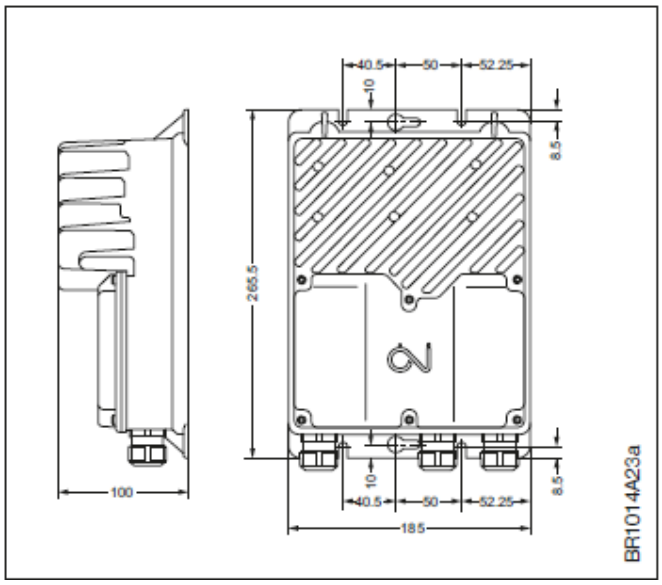

Fig. 3-3:

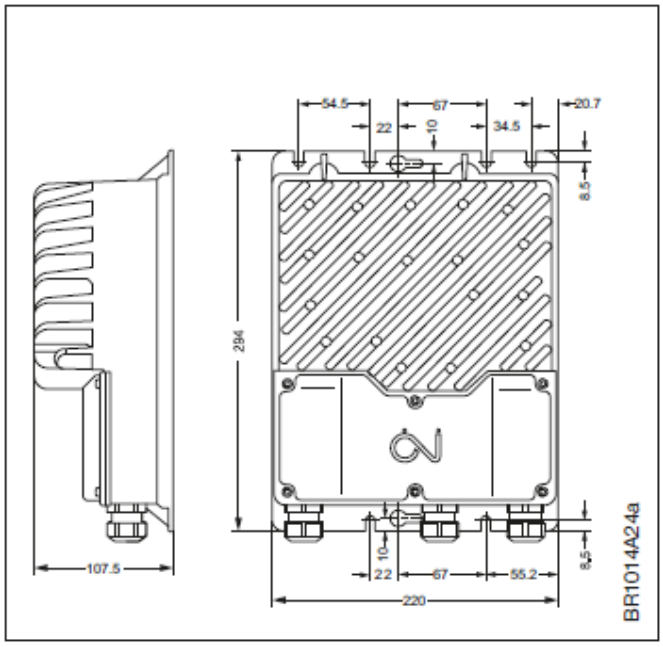

Fig. 3-4:

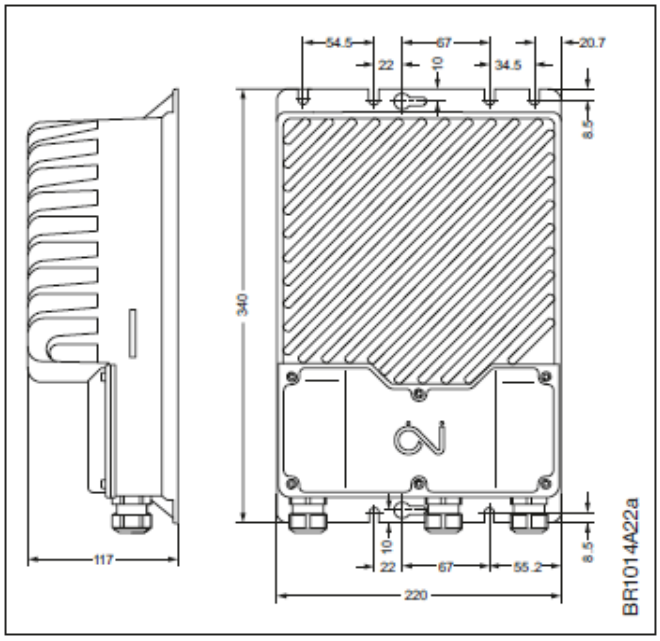

Fig. 3-5:

3.2. Mechanical installation

Warnung

Incorrect mechanical installation may cause overheating and impaired performance.

- NI-DV must only be installed by trained/experienced personnel.
- To ensure proper cooling of NI-DV, it must always be positioned in such a way that the passing air flow (> 3 m/s) can cool the NI-DV cooling fins. Reduced air flow (< 3 m/s) reduces power (kW). See Section 8. Technical Specifications.
- To facilitate future service and maintenance tasks, ensure that there is sufficient space around the unit after it has been installed.
- To achieve the specified enclosure rating, the cable glands must not point upwards (see fig. 3-6).
- To prevent water from entering NI-DV via cables and cable glands, ensure that connection is performed in such a way that water is prevented from accumulating around the cable in the gland. See fig. 3-7.
- Check that the surface to which NI-DV is attached is capable of supporting the entire weight of the unit.
- NI-DV can be mounted vertically, horizontally or at an incline. See fig. 3-6.
- NI-DV must be installed on a flat solid surface.
- To avoid unnecessarily long motor cables (max. 5 m), NI-DV should be installed as close to the motor as possible.
- Use only the pre-cut installation holes/screw holes to secure NI-DV in place.
- Dimensioned drawings, see figs 3-2 to 3-5.

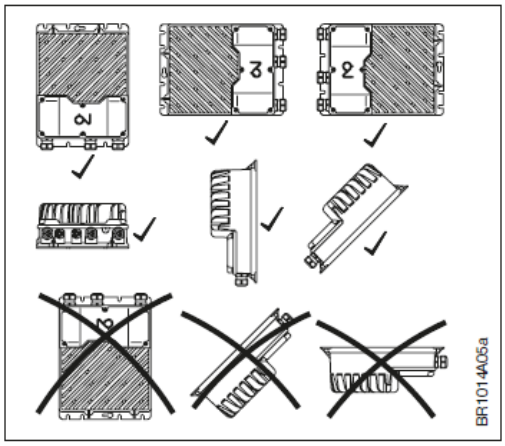

Fig. 3-6:

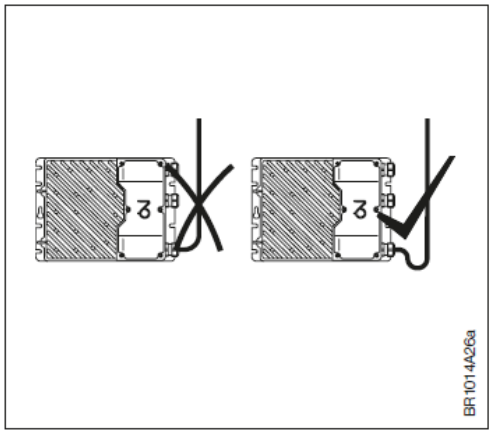

Fig. 3-7:

3.4. Electrical installation

Warning

- NI-DV must only be installed and commissioned by trained/qualified personnel.
- Check that the data specified on the rating plate of the motor matches the data specified on the NI-DV rating plate.
- Incorrect electrical installation may cause a risk of severe or fatal personal injury.

3.4.1. Dangerous induced voltage

Warning

- If natural drafts through the duct system cause the fan to rotate even when it has not received an operating signal, there is a risk that the motor will induce voltage on the NI-DV motor terminals, making them dangerous to touch.

3.4.2. EMC-compliant installation

Caution

- Always use shielded cables as motor cables.
- Shielded cable is not necessary for I/O and Modbus communication.
- Cable shields must always be electrically connected to the earthed product enclosure.
- Use the internal, factory-fitted cable clamps to ensure proper shield connection.
- Never convey mains voltage, motor connections and control signals in the same cable.

3.4.3. Short-circuit protection

- Short-circuit protection for the supply side of NI-DV is not provided together with the product.

Note

- Correct short-circuit protection must always be used ahead of NI-DV in accordance with local and international regulations.
- Short-circuit protection is supplied by the installer.

3.4.4. Supplementary protection

Warning

- Direct earthing or TN or TT system earthing can be used for supplementary protection.
- NI-DV must always be supplementary protected with an earthing wire connected to the protective earth terminal (PE).
- If an RCD/HPFI (TT system) is used, it must be specifically intended for

use with motor controllers.

3.4.5. Potential equalisation

Warning

- There is a risk of electrical interference if the ground potential between the NI-DV and the air handling unit or duct differ from each other. In the event of potential differences between system components, an equalisation conductor must always be fitted.
- Recommended cable cross section: 10 mm².
- Lugs should be used, and the equalisation conductor should be attached to the NI-DV enclosure via one of the screws used to mechanically install the unit.

3.4.6. Earth connection (PE)

Warning

- NI-DV must be earthed in accordance with applicable local and international standards and directives.
- In power and motor cables, use an earthing lead which is suitable for the purpose.
- NI-DV units must be earthed singly and must therefore never be earthed in series.
- Keep earth connection wires as short as possible.

3.4.7. Cable requirements

- All cables and leads used in connection with NI-DV must comply with local and national rules and regulations.
- Motor cables must be shielded to prevent electrical noise (EMC).

Note

- A 6-core, unshielded, 30 AWG/0.066 mm² telecommunications cable can be used for the Modbus cable.
- Generally, cable types with copper wires are recommended.
- For recommended cable dimensions, see table 3-2.

Product name					
	Cable gland	Cable diameter	Cable size, min.	Cable size, max.	Core sleeve/ /stripped min.
H1	M20	7 – 13 mm	3 x 1,5 mm²	3 x 2,5 mm²	10 mm
H3	M20	7 – 13 mm	4 x 1,5 mm²	4 x 2,5 mm²	10 mm
H4	M20	7 – 13 mm	4 x 1,5 mm²	4 x 4 mm²	15 – 10 mm
H5	M25	10 – 17 mm	4 x 2,5 mm²	4 x 10 mm²	18 – 10 mm
Motor cable					
	Cable gland	Cable diameter	Cable size, min.	Cable size, max.	Core sleeve/ /stripped min.
H1	M20	7 – 13 mm	3 x 1,5 mm²	3 x 2,5 mm²	10 mm
H3	M20	7 – 13 mm	4 x 1,5 mm²	4 x 2,5 mm²	10 mm
H4	M20	7 – 13 mm	4 x 1,5 mm²	4 x 4 mm²	15 – 10 mm
H5	M25	10 – 17 mm	4 x 2,5 mm²	4 x 10 mm²	18 – 10 mm
A/D-control cable					
	Cable gland	Cable diameter	Cable size, min.	Cable size, max.	Core sleeve/ /stripped min.
H1	M20	7 – 13 mm	2 x 0,7 mm²	10 x 2 x 0,7 mm²	10 mm
H3	M20	7 – 13 mm	2 x 0,7 mm²	10 x 2 x 0,7 mm²	10 mm
H4	M20	7 – 13 mm	2 x 0,7 mm²	10 x 2 x 0,7 mm²	10 mm
H5	M20	7 – 13 mm	2 x 0,7 mm²	10 x 2 x 0,7 mm²	10 mm
External braking chopper					
	Cable gland	Cable diameter	Cable size, min.	Cable size, max.	Core sleeve/ /stripped min.
H1	M16	4 – 10 mm	2 x 1,0 mm²	2 x 2,5 mm²	10 mm
H3	M16	4 – 10 mm	2 x 1,0 mm²	2 x 2,5 mm²	10 mm
H4	M16	4 – 10 mm	2 x 1,0 mm²	2 x 2,5 mm²	10 mm
H5	M16	4 – 10 mm	2 x 1,0 mm²	2 x 2,5 mm²	10 mm
Modbus round cable					
	Cable gland	Cable diameter	Cable size, min.	Cable size, max.	Core sleeve/ /stripped min.
H1	M16	4 – 10 mm	2 x 1,0 mm²	2 x 2,5 mm²	10 mm
H3	M16	4 – 10 mm	2 x 1,0 mm²	2 x 2,5 mm²	10 mm
H4	M16	4 – 10 mm	2 x 1,0 mm²	2 x 2,5 mm²	10 mm
H5	M16	4 – 10 mm	2 x 1,0 mm²	2 x 2,5 mm²	10 mm
Modbus ribbon cable					
H1 ... H5: Telecommunication cable/ribbon cable, 6-core, unshielded, 30 AWG/0.066 mm²					

Table 3-2:

3.4.8. Opening the NI-DV

- Check that the voltage supply to NI-DV has been disconnected before opening the cover.
- Wait approx. 3 minutes after disconnecting mains voltage before removing the cover.
- NI-DV is opened by loosening the six Torx 20 screws holding the plastic cover in place.
- Carefully remove the loosened cover.

3.4.9. Cable entries – cable glands – strain relief

- The factory-fitted cable glands should be used when inserting power, motor and control cables into NI-DV.
- Remember to re-tighten the cable glands to ensure ingress protection and strain relief.
- If Modbus communication is based on 6-core, unshielded, 30 AWG/0.066 mm² telecommunication cable, the cable must be inserted through the purpose-moulded rubber seal. See fig. 3-8.

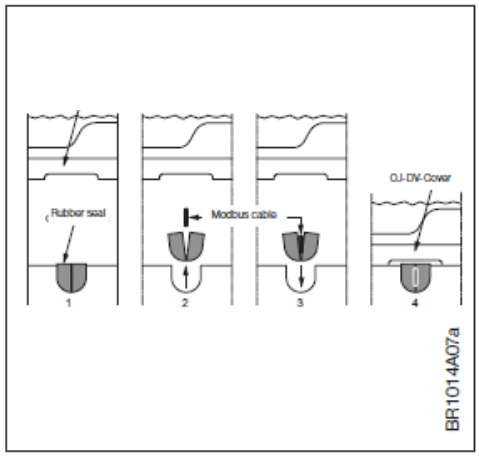

Fig. 3-8:

- The rubber seal has a cut insertion slit and assure the product enclosure rating if properly fitted. See fig. 3-8.
- The Modbus cable entry features 3-point strain relief, which must be used.

3.4.10. Spring terminals

- If multi-core cables/leads are used, core sleeves/ end sleeves must always be used.
- The connection terminals are spring loaded and the stripped wire can be easily inserted into the terminal by carefully pushing the wire into the terminal without using tools. Alternatively, the terminal spring can be loosened by pressing it lightly with a screwdriver or similar implement. See fig. 3-9.

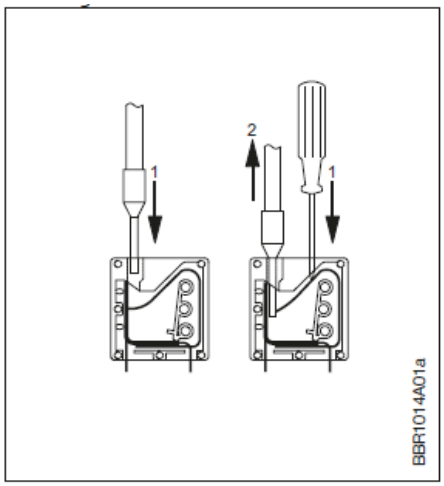

Fig. 3-9:

- Solid and multi-core cables/leads can be used.
- Stripped wire ends or end sleeves must be between 8 and 15 mm.
- Wires can be removed by carefully loosening the terminal spring by pressing lightly with a screwdriver or similar implement. See fig. 3-9

3.4.11. Terminal and connector overview

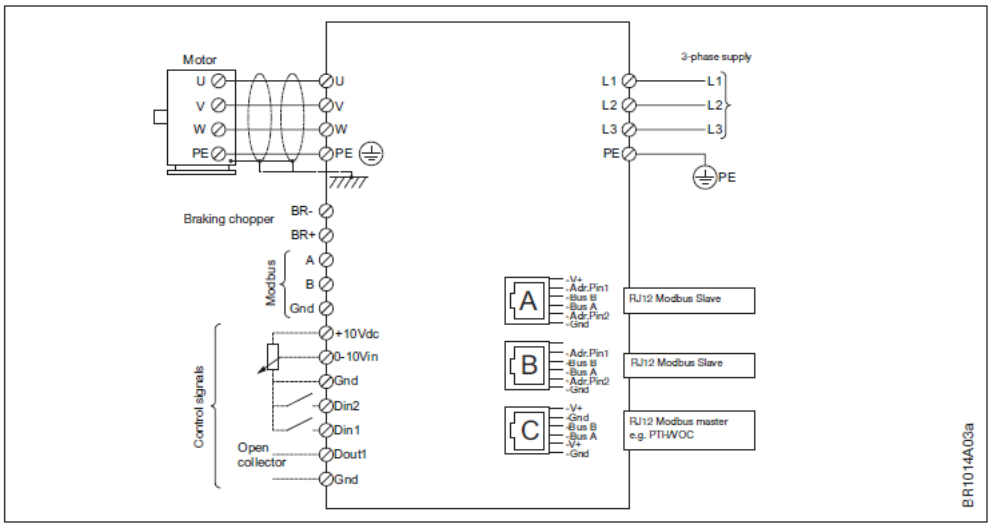

Fig. 3-10

3.4.12. Motor connection

- The motor cable must be connected to the terminals marked ”U”, ”V”, ”W” and ”PE”.
- When the stripped wire is properly inserted into the terminal (see section 3.4.10), the terminal tensions automatically with the correct torque.

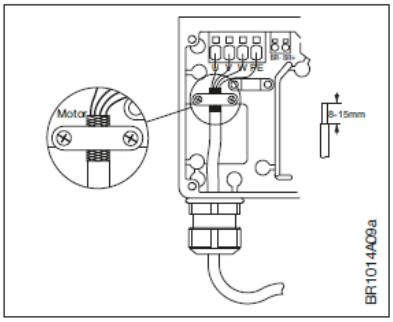

Fig. 3-11

- IMPORTANT! The motor cable must always be a shielded cable and the shield must be ended in the clamp intended for that purpose. See fig. 3-11.
- Remember to re-tighten the cable glands to ensure ingress protection and strain relief.

3.4.13. Mains voltage connection

- With 3-phase NI-DV units, connect the power cable to the terminals marked ”L1”, ”L2”, ”L3” and ”PE”. See fig. 3-12.1. On 1-phase NI-DV units, the terminals are marked ”L”, ”N” and ”PE”. See fig. 3-12.

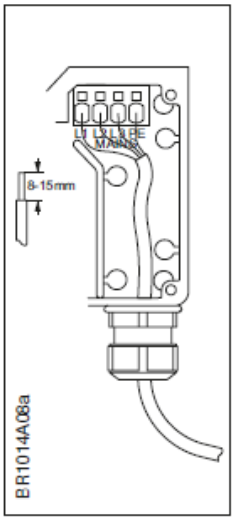

Fig. 3-12.1

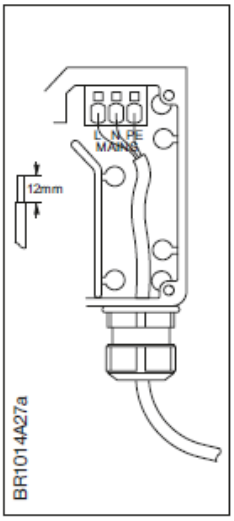

Fig. 3-12.2

- It is recommended that the PE wire is 20 mm longer than the other wires in the cable. If the cable is accidentally pulled out of the NI-DV while there is voltage on the cable and terminals, the PE wire will then be the last to be disconnected. NI-DV is thus prevented from causing electric shock.
- When the stripped wire is properly inserted into the terminal (see section 3.4.10), the terminal tensions automatically with the correct torque.
- Remember to re-tighten the cable glands to ensure ingress protection and strain relief.

3.4.14. Modbus connection

- NI-DV is equipped with four connectors for Modbus connection.
- It also features 3 x RJ12 connectors and one strip of spring terminals.
- On the terminal strip with spring terminals for control signals (A/D I/O), the terminals for connecting Modbus are marked ”Bus A”, ”Bus B” and ”GND”. See fig. 3-13.1.

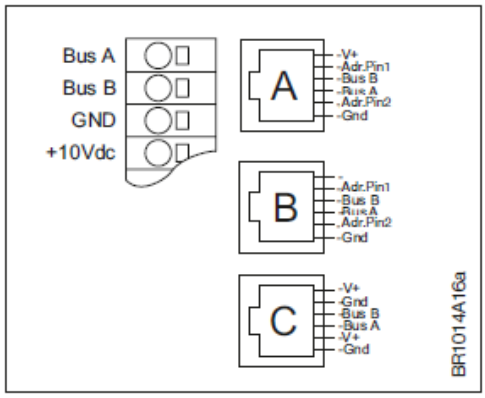

Fig. 3-13.1

- If wanted, a round cable can be used for Modbus communication, connected to terminals marked ”Bus A” and ”Bus B” on the NI-DV terminal strip.
- The Modbus terminals are internally connected in parallel to the Modbus pins in the RJ12 connectors marked ”A” and ”B”.
- The three 3 RJ12 connectors are marked ”A”, ”B” and ”C”.
  - ”A”: Modbus connection, slave, +24V voltage supply in connector.
  - ”B”: Modbus connection, slave, no voltage supply in connector.
  - ”C”: Modbus connection, master, external equipment, e.g. PTH/VOC. See fig. 3-10.
- A 6-core, unshielded, 30 AWG/0.066 mm² telecommunications cable or similar type of ribbon cable can also be used for Modbus communication.
  - Attach RJ12 connectors to both ends using a special-purpose tool.

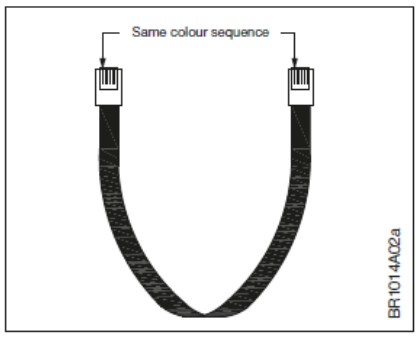

Fig. 3-13.2

Note RJ12 connectors must be fitted to the ends in such a way that both connectors have the same colour sequence as the cable. See fig. 3-12-2.

3.4.15. A/D control signal connections

- Connect A/D control signals to the terminal strip, see fig. 3-14.1
- For further information on using the spring terminals, see section 3.4.10.
- The function/programming of A/D inputs and outputs can be changed via Modbus.
  For further information on the Modbus protocol, contact Nicotra Gebhardt GmbH
  - +10Vdc = Constant +10 V=
  - 0-10V In = Analogue 0-10 V control input for speed
  - 0-0,5V = Stop
  - 0,5V = min. rpm
  - > 9,5 = max. rpm
    - Potentiometer, electrical connection, see fig. 3-14.2 (Potentiometer: min. 500 Ω, recommended 4,7 kΩ)
    - External control, electrical connection, see fig. 3-14.3
- **GND** = Ground (−)
- **Din2** = Without function
- **DIN1** = Alarm reset (factory setting)
  - Digital input
  - Electrical connection, see fig. 3-14.4.
- **Dout1** = Alarm active (factory setting)
  - Digital output
  - Max. Pull-up-voltage 24 V, max. current 20 mA
  - Electrical connection, see fig. 3-14.5
- GND = Ground (−)

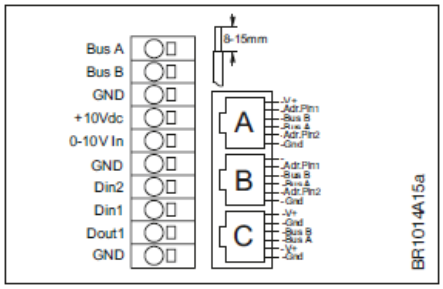

Fig. 3-14.1

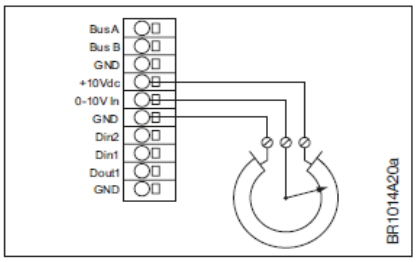

Fig. 3-14.2

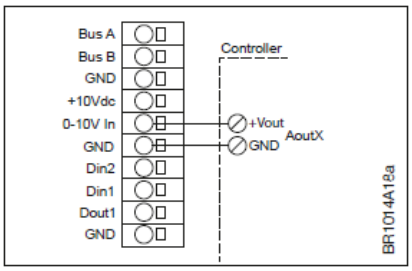

Fig. 3-14.3

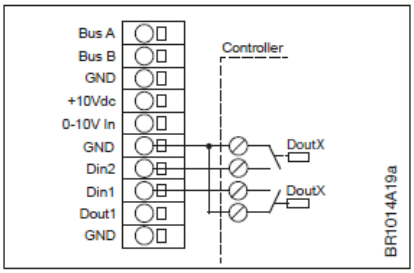

Fig. 3-14.4

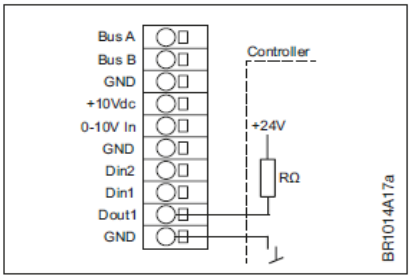

Fig. 3-14.5

3.4.16. Braking chopper connection

- The terminals for connecting a braking chopper are located beside the motor output terminals and are marked BR- and BR+.
- If an external braking chopper is used, a strain relief gland must be used to prevent mechanical overload and cable breakage. See fig. 3-15.
- If an externally mounted braking chopper is used, remove the blank gland and replace it with an M16 gland with nut.

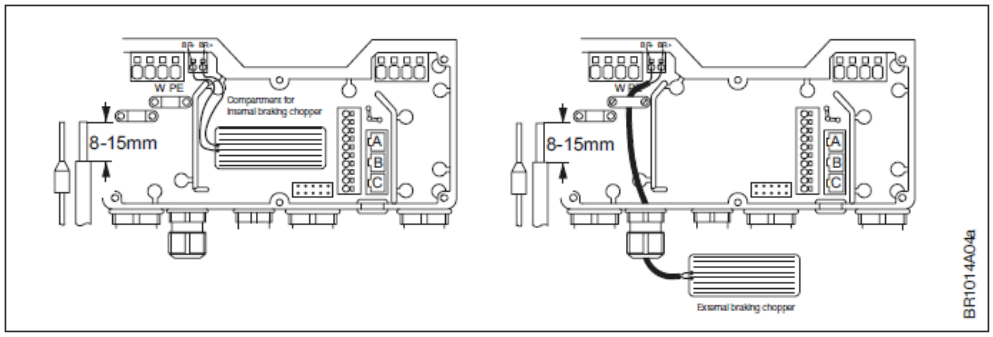

Fig. 3-15

3.4. Checklist – mechanical and electrical installation

Item to be checked	Description of check	√
Completion	Check that the entire installation is ready to be commissioned, both electrically and mechanically, before energizing the installation.	
	Check that no people or animals are present in the vicinity of moving parts.	
Product conformity	Check that the mains voltage on the supply terminals corresponds to the rated input voltage of the NI-DV.	
	Check the rating plates of the motor and NI-DV to ensure that the units have been sized correctly.	
Mechanical installation	Check that NI-DV is correctly and securely attached to a flat surface. See Section 3.2 in this manual.	
	Check that there is a free, unobstructed passage of air to the cooling fins. See Section 3.2 in this manual.	
	Check that the NI-DV terminal cover has been correctly fitted and that all screws have been tightened before energizing the product.	
	Check that all unused cable glands and other unused openings are appropriately blanked off in accordance with the applicable enclosure rating.	
Ambient conditions	Check that requirements on the surrounding environment have been met. Check that temperature and other environment specifications are observed. See technical specifications, Section 8 in this manual.	
Cabling	Check that all cabling has been fitted correctly and that motor and control cables are kept apart in separate cable conduits.	
	Check that the motor cable is a shielded cable and that its length is no longer than 5 metres.	
	Check that all cables are securely attached and relieved of tension and torsion.	
Electrical installation	Check that cables have been correctly inserted into NI-DV and that the cable glands have been correctly tightened.	
	Check that the NI-DV voltage supply terminals have been connected to the correct mains voltage level.	
	Check that all cables are correctly ended and securely attached.	
	Check that all cables are free of visible damage throughout their length.	
	Check whether there are any loose connections, which may cause overheating and serious damage to the product and property.	
Mains voltage	Check that the mains voltage wires have been correctly fitted to the supply terminals: one-phase on terminals ”L”, ”N” and ”PE” and three-phase on terminals ”L1”, ”L2”, ”L3” and ”PE”.	
	Check by means of voltage measurement that there is the correct voltage on the terminals.	
	Check short-circuit protection and supplementary protection.	
Motor connection	Check that motor cables are correctly connected to ”U”, ”V”, ”W” and ”PE” – and check that tightening torque is correct on the spring terminals of the motor.	
Control and signal wires	Check that control cables are ended correctly and securely attached.	
	Check that both ends of the Modbus cable have been attached to the correct connectors.	
Shield	Check that the motor cable shield is ended correctly and use continuity measurement to check that the shield is connected to an active earth connection at both ends.	
Fuses and circuit breakers	Check that active short-circuit protection has been correctly fitted and sized.	
	Check that all safety equipment is operative and set correctly.	
Earthing	Check that all earth connections in the motor and NI-DV are correctly connected and free of oxidation.	
	Check by means of continuity measurement that the earth connection is active and that the contact resistance complies with applicable local and international directives and regulations.	

4. Operation

4.1. Hand terminal (Hterm) – connection and functions

- The NI-DV range can be connected to an OJ-DV Hterm hand terminal via Modbus RJ12 connector ”A”. See fig. 4-1.
- If an OJ-DV Hterm is connected, the hand terminal will act as master and the NI-DV as slave.
- Only one master at a time can be connected to the RJ12 connectors marked ”A” and ”B”. It is thus not possible to connect both a hand
- terminal to connector ”A” and an active Modbus communication cable to connector ”B” at the same time.

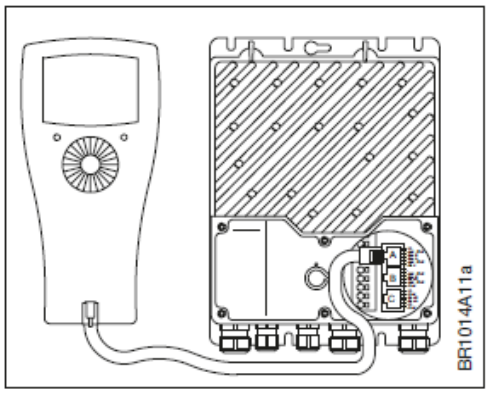

Fig. 4-1:

- OJ-DV Hterm has the following menu options:
  - Status: Control and operating parameters for connected NI-DV
  - Setup: Setting application parameters
  - Alarm: Read-out of alarm log for connected NI-DV
  - Modbus: Changing Modbus settings for NI-DV
  - About: Read-out of software version no. and type for connected NI-DV
  - Config: Changing NI-DV/motor settings

Note For further information on OJ-DV Hterm operation and menus, contact Nicotra Gebhardt GmbH.

4.2. PC-Tool – connection and functions

- The NI-DV range can be configured using OJ-DV PCTool, which must be connected to Modbus RJ12 connector ”B”.
- OJ-DV PCTool allows motor and controller parameters to be viewed and set, including:
  - Status: Control and operating parameters for connected NI-DV
  - Setup: Setting application parameters
  - Alarm: Read-out of alarm log for connected NI-DV
  - Modbus: Changing Modbus settings for NI-DV
  - About: Read-out of software version no. and type for connected NI-DV
  - Config: Changing NI-DV/motor settings
  - Log data: Read-out of log files
  - Firmware: Updating firmware
  - Motor: Configuring motor parameters
  - Fan: Configuring fan parameters
  - Hardware: Configuring NI-DV hardware

Note OJ-DV PCTool is used solely by fan and system manufacturers. For further information on OJ-DV PCTool operation and menus, contact Nicotra Gebhardt GmbH.

4.3. Optional modules – connection and function

- Various optional modules can be connected to NI-DV, providing extra versatility where the unit is to be built into systems and applications that require additional inputs and outputs.

Note For further information on the possibilities offered by optional modules, contact Nicotra Gebhardt GmbH.

5. Functions

5.1. Analogue/digital control

- NI-DV can be controlled via analogue/digital (A/D) inputs or via Modbus.
- The factory setting is analogue/digital (A/D) control.
- Connect A/D control signals to the terminal strip, see section 3-14.1.

0-10 V In

- Is used to control motor speed in relation to a 0-10V signal.
- With A/D control, functions such as alarm read-out and acknowledgement are still possible via Modbus even though "Modbus control" is not activated.

Note

- The relationship between the 0-10V control signal and motor speed depends on the settings for min./max. speed and ramp up/ramp down times. See figs 5-1 and 5-2
- The ”+10Vdc”, ”0-10V In” and ”GND” terminals can be connected to a potentiometer, see electrical connection in fig. 3.14.2.

The function of the digital inputs and outputs has been defined by Nicotra Gebhardt GmbH as follows:

- Din1 = Alarm reset (1 = Alarm reset)
- Din2 = Without function
- Dout1 = Alarm out

Note The digital inputs and outputs can be given alternative functions via Modbus.

Relationship between control signal (0-10V In) and speed – see fig. 5-1.

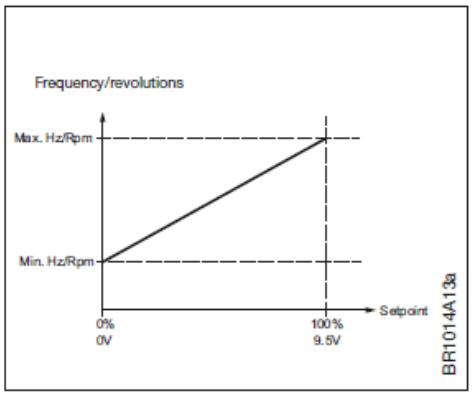

Fig. 5-1:

The control signal regulates motor speed between the set minimum and maximum speeds (AC motor=Hz; PM/BLDC motor=rpm) and the set ramp times – see fig. 5-2.

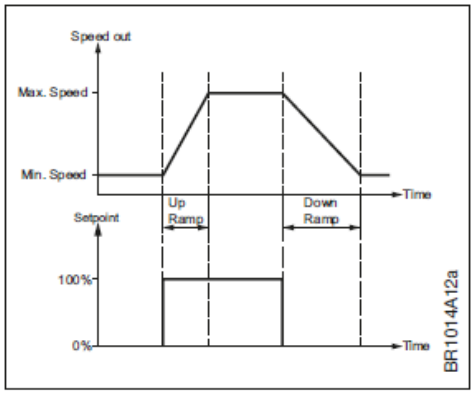

Fig. 5-2:

5.2. Modbus control

- NI-DV can be controlled via Modbus commands according to the Modbus protocol.
- Control of motor speed via Modbus communication is factory disabled.
- If NI-DV is to be controlled via Modbus, Coil Stat Bit register 8 must be set to ”0” = ”Modbus control”.
- Other functions, such as alarm read-out and acknowledgement, are still possible via Modbus even though "Modbus control" is not activated.
- *NOTE! Contact Nicotra Gebhardt GmbH if you require the Modbus protocol.*

5.3. Switching frequency

Switching frequency is crucial in determining the amount of audible acoustic noise emitted by OJDV.
The higher the switching frequency, the less audible noise will be emitted by NI-DV. At the same time, however, internal losses will be increased, reducing efficiency.
NI-DV can be set to operate constantly with a switching frequency of either 4 kHz or 8 kHz, or it can be set to change switching frequency automatically depending on motor speed (AUTO setting).
Switching frequency (switching mode) is set via Modbus:

- Setting ”4kHz” = Constant 4kHz switching frequency
- Setting ”8kHz” = Constant 8kHz switching frequency

- Setting ”AUTO” = Switching frequency is changed automatically:
  - At motor speeds higher than 60% of rated speed, switching frequency is changed to 4 kHz
  - At motor speeds lower than 50% of rated speed, switching frequency is changed to 8 kHz

5.4. Braking power

- The electronics within NI-DV can as a starting point supply braking power corresponding to its own consumption. It is expected that an air flow capable of maintaining typically up to 30% of nominal fan speed can be braked by this function.
- If greater braking power is required, an internal braking chopper capable of supplying braking power for brief periods can be connected.
- If maximum braking power is required, an external braking chopper capable of supplying up to 1/3 of nominal NI-DV power can be connected.

5.5. Fire mode

- Fire mode designates a function in which NI-DV is kept operating by an emergency program which disables the alarm monitor.
- Among other things, the function can be used in connection with smoke extraction from a burning property. When fire mode is activated, an extraction fan will continue to remove smoke from the property for as long as possible.
- In fire mode, NI-DV is able to maintain operation for at least an hour even when NI-DV and the fan motor are overheated (max. 70°C).
- In fire mode, the overheating protection built into NI-DV is disabled and the motor is not stopped if communication is lost.
- In fire mode, the fan is not stopped in case of faults or other alarms form either the fan or the OJDV.
- Speed is controlled to the actual setting, determined by an external 0-10V signal, a potentiometer or via Modbus from a Modbus master controller.
- Fire mode can be activated via Modbus.

5.6. Built-in protection

- If the temperature inside NI-DV exceeds 95°C, NI-DV will attempt to reduce its internal heat generation by reducing motor speed (rpm).
- NI-DV has built-in current limitation for the protection of motor and cables and cannot therefore supply more current than it is set to.
- In the event of lacking phase on the supply input, NI-DV will reduce speed and activate a noncritical alarm.
- The NI-DV motor output terminals are short-circuit protected against phase-to-phase short circuiting.

5.7. Alarms

- NI-DV has a built-in alarm monitor, which monitors optimal fault-free operation and triggers an alarm if operating or performance problems are observed.
- Alarms are either **"Critical"** alarms or **"Non-critical"** alarms.
- **"Critical"** alarms stop the motor.
- **"Non-critical"** alarms reduce motor performance.
    - The built-in alarm monitor stops the NI-DV.
    - If the alarm situation passes, the alarm is automatically reset and NI-DV restarted.
    - If the maximum number of restarts (5 times/60 min) is exceeded, the alarm must be reset manually.
    - The alarm can be reset by means of a Modbus command.
    - The alarm is automatically reset if the power is disconnected for longer than 60 seconds.
    - Alarms can be read via Modbus, see Modbus protocol.
    - Alarm overview, see 5-1.

Alarm overview	**Alarm priority**	**Motor operation/ response**
Insufficient supply voltage	**„NC“**	**„RP“**
Excessive supply voltage	**„C“**	**„SA5“**
Excessive power consumption by motor	**„C“**	**„SA5“**
Excessive temperature inside NI-DV (> 95°C)	**„NC“**	**„RP“**
Phase fault; one or more phases disconnected (L1, L2, L3)	**„C“**	**„SA5“**
Blocked motor	**„C“**	**„SA5“**
Motor current has reached its limit	**„NC“**	**„RP“**
Internal hardware fault	**„C“**	**„SA5“**
Wrong direction of rotation	**„C“**	**„SA5“**
Fault in internal EEPROM circuit	**„NC“**	**„RP“**
Stopped after 5 attempted restarts within 60 min	**„C“**	**„S“**
Fault in braking chopper	**„NC“**	**„RP“**
Phase fault on motor power supply (U, V, W)	**„C“**	**„SA5“**
Internal communication error	**„C“**	**„SA5“**
Excessive ripple voltage	**„NC“**	**„RP“**
External 24VDC power supply overloaded	**„NC“**	**„RP“**

Table 5-1:

Abbreviations:

„C“ Critical alarm
„NC“ Non-critical alarm
„RP“ Reduced performance
„SA5“ Motor stops after 5 restarts caused by same fault within 60 min
„S“ Motor stops immediately

LED indications

- NI-DV is equipped with a two-colour LED which indicates operating status.
- The LED is located on the underside of NI-DV beside the entry for the mains cable. See fig. 5-3.

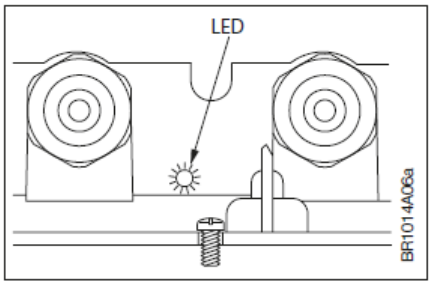

Fig. 5-3:

  - Lights constantly green when mains voltage is connected
  - Flashes green when Modbus communication is active
  - Lights constantly red when at least one critical alarm is active
  - Flashes red when at least one non-critical alarm is active

6. Maintenance and troubleshooting

6.1. Modbus addressing of NI-DV

Modbus addressing of NI-DV can be accomplished in two different ways.

- Via the addressing pins of the ”A” or ”B” connectors – see fig. 3-13.1 and table 6-1.

Table 6-1:

Add. / Pin. no.	0X36 (54 dec)	0X37 (55 dec)	0X38 (56 dec)	0X39 (57 dec)
Add.Pin1				
Add.Pin2				

= No connection between ”GND” and Add.Pin1/ Add.Pin2

= Connection between ”GND” and Add.Pin1/ Add.Pin2

- Via OJ-DV PCTool, where NI-DV can be set to other Modbus addresses – see instructions for OJ-DV PCTool.

Modbus protocol

- Contact Nicotra Gebhardt GmbH if you require a complete Modbus protocol.

6.2. Maintenance

NI-DV is maintenance free under normal operating conditions and load profiles.
The cooling fins must be kept free of dust, dirt and other foreign matter so that air can pass freely over them. Deposits of dust, dirt or other foreign matter on and between the cooling fins will prevent cooling of the NI-DV and thus impair performance.

Caution

The cooling fins may become very hot. (Max. 95°C under normal operating conditions.)

Warning

NI-DV cannot be repaired on site. Never attempt to repair a defective unit. Contact your supplier to obtain a replacement. Additional technical data are available on request from Nicotra Gebhardt GmbH.

6.3. Troubleshooting

Before opening NI-DV, the mains voltage must be disconnected for at least 3 minutes to ensure there is no risk of dangerous residual currents in electronic circuits or capacitors.

If natural drafts through the duct system cause the fan to rotate even though it has received no operating signal, there is a risk that the motor will induce voltage on the NI-DV motor terminals, making them dangerous to touch.

6.3.1. Troubleshooting when NI-DV is controlled via A/D signals:

Symptom	Cause	Action
Motor inoperative	Lacking supply voltage	Check the voltage supply to NI-DV terminals "L" and "N" on 230V models (H1) or terminals "L1", "L2" and "L3" on 3x400V and 3x230V models (H3…H5). (Nominal supply voltage is stated on the rating plate.)
		Check whether short-circuit protection has been activated.
		Check that the voltage supply to NI-DV has not been cut off by other components.
	Poor electrical connections	Check electrical connections.
	Wrong motor for NI-DV setup	Check that the correct motor settings have been read into and stored in the NI-DV setup.
	Lacking operating signal	Not active for the Nicotra Gebhardt configuration / factory setting.
	Lacking 0-10VDC control signal	Check that an operating signal is connected to "0-10V In".
		Potentiometer control: Check that the potentiometer is correctly connected to terminals "+10Vdc", "0-10V In" and "GND" on the terminal strip.
	Active alarm	Read out active alarms and remedy their cause.
	The motor has been stopped 5 times by the built-in motor protector because of overloading or other alarm	Reset the alarm by short-circuiting the "Alarm reset" input – digital input Din1 or Din2 depending on the setup. The alarm can also be reset by disconnecting the power supply to the NI-DV and reconnecting it after approx. 60 seconds.
	Defective NI-DV controller	Replace NI-DV. Never attempt to repair a defective NI-DV controller. Contact your supplier for replacement/repair.
	Defective motor	Replace motor.
Motor running in wrong direction	Wrong phase sequence in motor cable	Interchange two phase wires on the motor or the NI-DV terminal strip.
NI-DV noisier than Acceptable	Switching frequency too low	Increase switching frequency. 0 = Auto 1 = Low = 4 kHz 2 = High = 8 kHz Increasing switching frequency increases losses within NI-DV, thus reducing efficiency. NI-DV switching frequency can be changed via OJ-DV Hterm or via Modbus.
NI-DV cuts out due to an alarm	At least one alarm active	Use OJ-DV Hterm to view the alarm and determine which alarm has stopped the controller/motor.
		Reset the alarm by short-circuiting the "Alarm reset" input – digital input Din1 or Din2 depending on the setup. The alarm can also be reset by disconnecting the power supply to the NI-DV and reconnecting it after approx. 60 seconds.
	The alarm is re-activated after reset	Use OJ-DV PCTool to view the alarm and determine which alarm has stopped the controller/motor.
		Remedy the cause of repeated alarm activation.

6.3.2. Troubleshooting when NI-DV is controlled via Modbus:

Symptom	Cause	Action
Motor inoperative	Lacking supply voltage	Check the voltage supply to NI-DV terminals ”L” and ”N” on 230V models (H1) or terminals ”L1”, ”L2” and ”L3” on 3x400V and 3x230V models (H3…H5). (Nominal supply voltage is stated on the rating plate.)
		Check whether short-circuit protection has been activated.
		Check that the voltage supply to NI-DV has not been cut off by other components.
	Poor electrical connections	Check electrical connections.
	Wrong motor for NI-DV setup	Check that the correct motor settings have been read into and stored in the NI-DV setup.
	Lacking operating signal	Check that NI-DV can receive an operating signal. Coil Stat Bits Register 0X0001: Motor start/stop (1=On).
	Lacking % control signal from Modbus controller	Check the Modbus control signal at Modbus address: Holding registers; Register 3X0001: PrcSet 0-10000 (0-100%).
	The motor has been stopped 5 times by the built-in motor protector because of overloading	Reset alarm: Coil Stat Bits Register 0X0002: Reset (1 pulse = Reset). The alarm can also be reset by disconnecting the power supply to the NI-DV and reconnecting it after approx. 60 seconds.
	Defective NI-DV controller	Replace NI-DV. Never attempt to repair a defective NI-DV controller. Contact your supplier for replacement/repair.
	Defective motor	Replace motor.
Motor running in wrong direction	Wrong phase sequence in motor cable	Interchange two phase wires on the motor or the NI-DV terminal strip.
NI-DV noisier than Acceptable	Switching frequency too low	Increase switching frequency. 0 = Auto 1 = Low = 4 kHz 2 = High = 8 kHz Increasing switching frequency increases losses within NI-DV, thus reducing efficiency. NI-DV switching frequency can be changed via OJ-DV Hterm or via Modbus.
NI-DV cuts out due to an alarm	At least one alarm active	Use OJ-DV Hterm to view the alarm and determine which alarm has stopped the controller/motor.
		Reset the alarm by short-circuiting the ”Alarm reset” input – digital input Din1 or Din2 depending on the setup. The alarm can also be reset by disconnecting the power supply to the NI-DV and reconnecting it after approx. 60 seconds.
	The alarm is re-activated after reset	Read out the alarm via Modbus registers and determine which alarm has stopped the controller/motor.
		Remedy the cause of repeated alarm activation.

7. Disposal

- NI-DV contains electronic components and must not be disposed of together with household waste.
- NI-DV must be disposed of in accordance with applicable local rules and regulations.
- NI-DV meets the requirements on marking of electronic waste contained in the European WEEE Directive 2012/19/EU.

8. Technical Specification

	Type	DV-1005	DV-1007	DV-1011	DV-315	DV-3024	DV-3030	DV-3040	DV-3055	DV-3065	DV-3075	DV-3110	DV-3150
Enclosure		H1			H3			H4				H5	
Power size	kW	0,5	0,75	1,1	1,5	2,4	3,0	4,0	5,5	6,5	7,5	11	15
Efficiency	%	> 94 %			> 96,5 %			> 96,5 %				> 96,5 % (2)	
Power supply													
Voltage	VAC	1 × 230 V~ 50/60 Hz ±10 %			3 × 400 V~ 50/60 Hz ±10 %								
Supply current at max. load	A	3,0	4,4	6,5	3,1	5,0	6,3	8,4	11,5	13,6	15,7	23,0(2)	31,3(2)
Power factor (cos phi) at max. load		> 0,99 (Active PFC)			> 0,9								
Motor output													
Nominal motor power (on shaft) *1	kW	0,5	0,8	1,15	1,5	2,4	3,0	4,0	5,5	6,5	7,5	11(2)	15(2)
Frequency	Hz	0-120											
Max. output voltage	Vrms	3 × 0-250 VAC			3 × 0-360 VAC								
Max. output current	Arms	2	3,2	4,5	4,5	6,4	8,0	11,7	16,0	19,0	19,0	28(2)	38(2)
Protection													
Max. fuse	A	16										32	
Motor output		Short-circuit protected between phases											
Motor		Protected by current limit											
Impulse protection		Protected against transient votage by VDR											
Over-voltage protection		Yes, 400 V (PTC)			Yes, 565 V								
Overload protection		Current and temperature overload protection											
Environment													
Operating temperature	°C	−40 to +50 °C											
Starting temperature	°C	−40 to +50 °C											
Storage temperature	°C	−40 to +70 °C											
Dimensions	mm	185 x 220 x 90			185 x 250 x 100			220 x 295 x 110				230 x 340 x 120(2)	
Protection rating	IP	65			65			54					
Enclosure material		Aluminium											
Front cover		Plastic											
Weight	Kg	2,0			3,0(*2)			3,9				5,0*(2)	
Humidity	%rH	10-95 %rH, non-condensing											
Vibration		Stationary: IEC 60721-3-3 Class 3M6 2,0 kg Non-stationary: IEC 60721-3-3 Class 3M6 25,0 kg											
Air flow / cooling		>3 m/s | full power | mounted inside air stream | no need for on-board fan <3 m/s | derated output power| typically mounted outside direct air stream | on-board fan can be added											
Interfaces													
Digital communication		MODBUS RTU RS485 (Baudrate: 9,6-19,2-38,4-115,2 kBaud)											
Digital communication	Slave	2 × RJ12 & 2 × spring terminals											
Digital communication	Master	1 × RJ12 connection											
Analog In1		0-10 V=, 100 % @ 9,5 V= ±2 %											
Analog Out1		+10 V=											
Digital In 1		Start/stop with internal pull-up											
Digital In2		Alarm reset											
Digital Out1		Tacho: 1 pulse/revolution | Alarm/running signal											
Greeen LED		Lit: Power connected | Flashing: Active communication											
Red LED		Flashing: Alarm but still running | Constantly lit: Critical alarm - stop motor											
Features													
Technology		Sinusoidal back-EMF signal controlled via FOC (Field Oriented Control)											
Flying start		Yes, typically below 30% of max. speed depending on load and fan weight											
Ramp-up time	sec.	15-300											
Ramp-down time	sec.	15-300											
Alarm		Yes											
Alarm reset		Via digital input, Modbus or powering down for more than 60 seconds											
Fan stop	sec.	The braking system stops the fan as quickly as possible. Braking time will depend on the inertia of the fan.											
Service data log		Operating hours, alarms, loads, software version, max. temp., max. motor voltage, max. motor current, max. ripple voltage, max. ripple current											
Software update		Yes, via serial interface											
Motor parameters		Preprogrammed by OJ or on-site configuration											
Fire mode		Nominal power for 1 hour at 70°C ambient temperature											
Field weakning		Yes											
Short-circuit protection		Yes											
EMC filter		Integrated											
Approvals													
EMC		EMC EN 61800-3 (C1 and C2)											
safety		EN 61800-5-1											
Product standard		EN 61800 Teil 2											
RoHS Directive		Yes											
Product approvals		CE											
Data are valid at	nominal supply voltage, +25°C, sufficient air flow												
Note 1:	Motor with cos-phi = 0.8 and efficiency = 80%												
Note 2:	Estimated values												

9. Handterminal

9.1. General

OJ-DV Hterm is a hand terminal for setting up and operating an NI-DV. The hand terminal can be used to adapt NI-DV operating parameters to the application concerned. It can also be used to read out current alarms.

Table 9-1:

Product type	
OJ-DV-Hterm	Service and operating unit for NI-DV

9.2. Installation

The NI-DV hand terminal (OJ-DV Hterm) can be mounted in the accompanying wall bracket (fig. 9-2), which must be fitted to a flat surface.
The hand terminal is removed from the wall bracket by pushing the terminal upwards and then pulling it out.

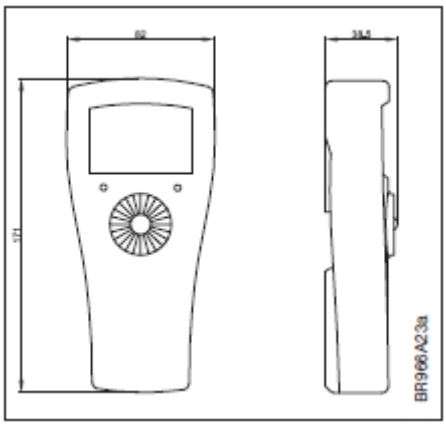

Fig. 9-1

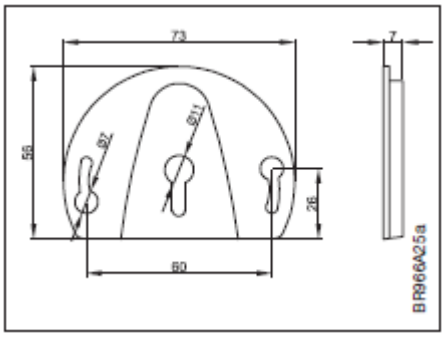

Fig. 9-2

9.3. Connection

OJ-DV Hterm must be connected to NI-DV Modbus port “A” (fig. 9-3) using a bus cable (cable type: 6-core, unshielded, 30 AWG/0.066 mm² telecommunications cable or similar ribbon cable) with RJ12/6 connectors on both ends (fig. 9-4).

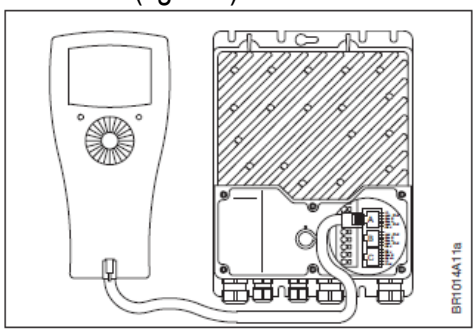

Fig. 9-3

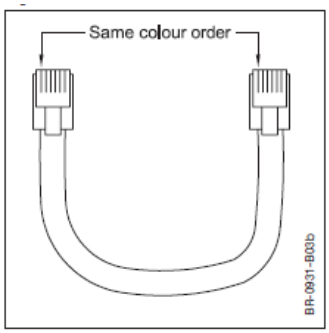

Fig. 9-4

Communication

The default NI-DV Modbus address is 54 and the default baud rate is 38.4 kbps.
The default Modbus address and baud rate can be changed using the hand terminal (OJ-DV Hterm). The hand terminal features a built-in “Autodetect” function, allowing NI-DV to automatically switch between the default Modbus

settings (38.4 8-N-1) and the alternative settings in the menu.

9.4. Functions

OJ-DV Hterm features an eight-line display, a navigation selector button and two LEDs.
Scroll upwards or downwards through the menus by turning the selector button and select an option by pressing the button.
Turn the button to change existing values. Save the new value by pressing the button. Select "Exit" to leave the menu.
The hand terminal communicates with NI-DV via Modbus commands. Factory and user settings are stored in NI-DV and the settings are remembered even if the voltage supply or connection to the hand terminal is lost.
OJ-DV Hterm contains the following six menus:

Status:	Control and operating parameters for connected NI-DV
Setup:	Application parameter settings
Alarm:	Read-out of active alarm(s) for connected NI-DV
Modbus:	Modbus settings for connected NI-DV
About:	Read-out of software version and type for connected NI-DV
Config.:	Drive configuration

Details of the various settings and read-outs are shown in table 9-2.
Note that a PIN code is required to open the “Config” menu and thus alter the configuration of the drive. Contact OJ Electronics to obtain this PIN code.

MAIN MENU	SETTING	DESCRIPTION	VALUE
Status	Operation	Start/Stopp des Motors	Stop/Start
	Set Setpoint	With OJ-DV Hterm set to “Hterm” in the “Start/Stop” / “Control” menu, the required setpoint for EC can be set in %. With OJ-DV Hterm set to “0-10 V DC” in the “Start/ Stop” / “Control” menu, the actual setpoint is displayed in %.	
	% Out	Displays actual revolutions in per cent of range (fig. 9-7)	0-100 %
	Rpm Out	Displays actual revolutions	PM: 0 - ?* rpm AC: 0 - ?* Hz
	Power	Displays actual input power	0 - ?* kW
	Analogue_In 1	Displays actual voltage on external setting input	0 - 10,0 V
	Digital_In 1	Displays actual status	„1“ = active „0“= inactive
	Digital_In 2	Displays actual status of fire mode	„1“ = active „0“= inactive
	Op. Time	Displays actual number of days of operation	0 - ? Days
	Op. Time	Displays actual number of minutes of operation	0 -? Minutes
	I out	Displays actual output current	0 -?* A
	V in RMS	Displays actual input voltage	0 - ?* V
	Temp	Displays actual temperature inside NI-DV	? - ? °C
	FIRE	I or external input has higher priority than "Normal".	„1“=FIRE / „0“=Normal
	Exit	Return to main menu	
MAIN MENU	**SETTING**	**DESCRIPTION**	**VALUE**
Setup	Control	Choice of control signal Control = Modbus NI-DV controlled via OJ-DV Hterm. External signals are ignored, incl.: Start/stop signal (ON/OFF), and external control signal on terminals (0-10 V in). Control = 0-10 V DC NI-DV controlled according to external control signals, incl.: Start/stop signal (ON/OFF), fire mode signal and external control signal (0-10 V in). External stop and stop from hand terminal have higher priority than start from hand terminal.	Modbus/0-10 V=
	Rotation	Setting rotation direction	„1“ = CW „0“ = CCW
	Min. rpm	Setting minimum revolutions (fig. 9-7)	PM: 0 - ?* rpm AC: 0 - ?* Hz
	Max. rpm	Setting maximum revolutions (fig. 9-7)	PM: 0 - ?* rpm AC: 0 - ?* Hz
	Up Ramp	Setting ramp-up time (fig.9- 6)	0 - ?* s
	Down Ramp	Setting ramp-down time (fig.9- 6)	0 - ?* s
	Switch Hz	Setting output switching frequency	Auto, Low, High
	Exit	Return to main menu	
Alarm	Reset Alarm	Activated to reset alarm when maximum number of restarts has been exceeded.	
	Alarm stop	Displayed in case of motor stop due to alarm.	
	Voltage low	Displayed in case of alarm due to insufficient mains voltage.	
	Voltage high	Displayed in case of alarm due to excessive mains voltage.	
	Phase error	Displayed in case of alarm due to one or more lacking phases in power supply.	
	Current high	Displayed in case of alarm due to excessive output current.	
	Current limiting	Displayed in case of active current limitation alarm (e.g. in the event of insufficient ramp time or overloaded motor).	

	V ripple	Displayed in case of alarm due to unstable mains voltage.	
	Temperature high	Displayed in case of alarm due to excessive temperature in frequency converter.	
	Rotor blocked	Displayed in case of rotor blockage.	
	Rotation direction	Displayed in case of wrong rotation direction.	
	Internal communicatio n error	Displayed in case of internal communication error.	
	Internal HW fault	Displayed in case of an internal hardware error.	
	EEPROM error	Displayed in case of an error in the internal memory (EEPROM).	
	Motor phase error	Displayed in case of a phase error on the motor side (U, V, W).	
	Brake chopper fault	Displayed in case of a brake chopper error.	
	Ext. 24V overload	Displayed in case of overload on the external 24V supply.	
	Exit	Return to main menu.	
Modbus	Address	Setting and displaying Modbus address	
	Baud rate	Setting and displaying baud rate	9600, 19 200, 38 400, 115 200 Bit/s
	Parity	Setting and displaying parity	None Odd Even
	Stop bits	Setting and displaying stop bits	1 2
	Timeout	Communication timeout	0-200 s
	Exit	Return to main menu	
About	Modbus addr	Displays NI-DV Modbus address	
	Drives type	Displays NI-DV type	1000 - ?*
	MOC SW ver	Displays NI-DV MOC software version	
	MOC Boot ver	Displays NI-DV MOC bootloader version	
	AOC SW ver	Displays NI-DV AOC software version	
	AOC Boot ver	Displays NI-DV AOC bootloader version	
	IO SW ver	Displays I/O module software version	
	HW Cfg var	Display Hardware configuration variant	
	HW Cfg ver	Display version of the Hardware configuration variant	
	Motor Cfg var	Displays motor configuration variant	
	Motor Cfg ver	Displays version of the motor configuration variant	
	Fan Cfg var	Displays fan configuration variant	
	Fan Cfg ver	Displays version of the fan configuration variant	
	User Cfg var	Displays user data variant	
	User Cfg ver	Displays version of the user data variant	
	Hterm SW ver.	Displays OJ-DV Hterm software version	
	Exit	Return to main menu	
Config	Drive configuration	Enter PIN code for access Please contact OJ Electronics	

Table 9-2: *= Depends on the size of the NI-DV concerned

9.5. Technical Data Hterm

Supply voltage	24 V= von NI-DV
Modbus RTU	2 × RJ12/6/6-pole RS485
Enclosure rating	IP21
Air humidity	10-95 % – non-condensing
Storage temperature	−30 °C..+50 °C
Operating temperature	0 °C..+40 °C
Dimensions	171 × 82 × 38,5 mm
Weight	150 g

9.6. LED Indication

The hand terminal has two built-in LEDs (fig. 9-5), which indicate the following:

	On	Flashing
Red LED		Alarm active
Green LED	OK	Override with hand terminal

Table 9-3:

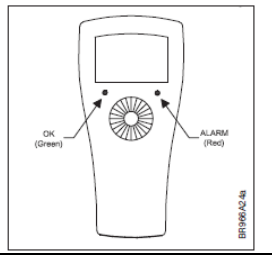

Fig. 9-5:

9.7. Alarms

Current alarms are displayed as shown in Table 1. Alarms are automatically reset if the alarm situation passes, and NI-DV is restarted. However, once the maximum number of restarts has been exceeded, the alarm must be reset by selecting "Reset Alarm" in the alarm menu. Alternatively, the ”Alarm reset” input on NI-DV can be short-circuited to earth (only if Control = 0-10V) or the voltage supply to NI-DV can be disconnected.

9.8. Service and Maintenance

No special maintenance is required.
Please contact your supplier if you experience problems with the product.

9.9. Disposal and Environmental protection

Help protect the environment by disposing of the packaging and redundant products in an environmentally responsible manner.

Product disposal:
Products marked with this symbol must not be disposed of along with household refuse but must be delivered to a waste collection centre in accordance with current local regulations.

Table 9-4:

Troubleshooting		
Symptoms	Cause	Action
No values/light in OJ-DV Hterm	NI-DV is switched off	Switch NI-DV on
	Defective Modbus cable	Replace Modbus cable
	RJ12 connector incorrectly fitted	Check connection at both ends
		Insert RJ12 connector into port “A” on NI-DV

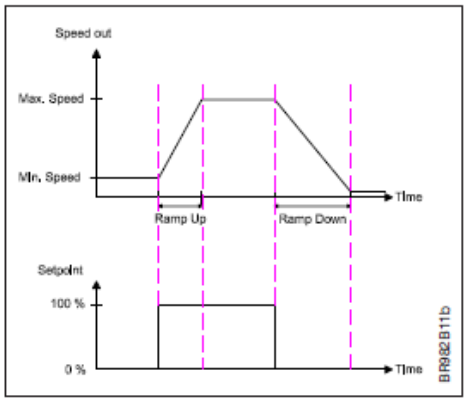

Fig. 9-6:

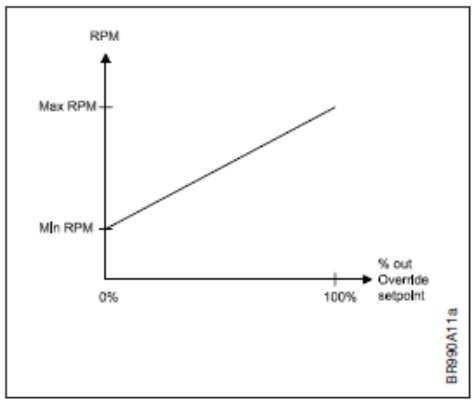

Fig. 9-7:

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