January 2020

Version 1.3

User Manual
MOVECAT NDB-6 and NMB-14

(Translation)

Control system for kinetic drives

in accordance to DGUV V54 and DGUV V17, IGVW SQ P2
as well as EN 61508 SIL 3

Safety first – made in Germany

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1. General

You have purchased an excellent product that is remarkable for its high quality, reliability and safety. MOVEKET products have been specially developed for use in the events, production and stage sectors and boast features and components that have been tried and tested in practice.

This operating instructions contain information and recommendations necessary to the safe and reliable use of the devices concerned. For this reason, before doing anything it is absolutely essential to read this manual through carefully and take note of the information and safety advice it contains.

The manual is aimed at competent and proficient persons in accordance with the BG guidelines as well as trained staff employed by the operator. The contents describe the correct and proper handling, maintenance, repair and testing of the devices. Please pay special attention to the safety instructions.

If you have any questions, your nearest MOVEKET dealer or the manufacturer will be happy to answer them.

1.1. Disclaimer

This manual, the technical specifications and other documentation have been prepared with the utmost diligence, based on the facts at the time of publication. Content changes may be made at any time without notice, whether to stay abreast of technological developments or to correct technical, grammatical or typographic errors.

Due to our policy of continuous development, it is possible that minor discrepancies may arise between the manual and the actual products or their features. No claim is made that the products as supplied correspond to the descriptions, technical illustrations or other information contained in this manual.

Warranty and liability claims deriving from products supplied, these operating instructions or the technical documentation provided shall be governed exclusively, to the exclusion of all other claims, by the principles contained in the General Terms and Conditions of the manufacturer.

1.2. Warranty

For devices and components manufactured by us, we offer a warranty following our general terms and conditions commencing with the date of delivery: during such time we will repair defects of which we are informed in writing and that are substantiated or else provide suitable replacements according to our choice. In the case of certain devices, the possibility exists of extending the warranty period in the context of a maintenance agreement. Here, the product-specific fundamentals must be borne in mind.

No claims under the warranty shall exist in respect of damage caused by inappropriate use, improper handling, testing or maintenance, the use of excessive force, induction or undervoltage, alterations or repairs conducted by the operator or user, or any other external influences.

For claims under the warranty, the device is to be returned unopened in the original packaging to the address given below, accompanied by a description of the defect. A copy of the purchase invoice must be enclosed!

Wear attributable to normal operation, parts subject to wear, and expendables are not covered by this warranty.

In principle, liability is excluded in respect of personal injury or damage to property if any of the following points are applicable.

The manufacturer accepts no liability for damage and disruption caused

- improper use
- inappropriate use
- operating errors
- improper transport, installation or commissioning
- unauthorized modifications made to hardware or software
- modification of safety or protective equipment
- improper maintenance and recommissioning
- use of non-original parts or accessories
- failure to respect the prescribed test intervals and procedures
- failure to respect the prescribed maintenance intervals and procedures
- failure to follow the operating instructions
- failure to observe the guidelines, standards or regulations in force or sound engineering practice
- extraneous events (e.g. natural disasters, external factors, force majeure)

1.3. Intellectual property /copyright

These operating instructions as well as all related technical documentation and materials are protected by copyright and may only be used for the operation, maintenance, commissioning and testing of the devices concerned by the operator or personnel authorized by the operator.

The disclosure to third parties, reproduction, dissemination or other use or exploitation of the material or extracts thereof is prohibited in the absence of the express permission in writing of the manufacturer. Violations will give rise to criminal prosecution as well as civil claims.

1.4. Safety symbols

Symbols are appended to certain paragraphs in this manual where they contain warnings, safety instructions or handling recommendations that must be observed. In addition to these, all generally applicable national regulations in respect of health and safety at work must be obeyed.

1.4.1. Warning signs

Warning signs draw attention through self-explanatory symbols to hazardous situations and health risks. When notice is paid to them, they make a notable contribution to safety and reduce the risk of accidents at the workplace. Failing to observe such warnings could result in serious injury or even death as well as considerable damage to the devices themselves.

Warning of general danger in the handling of the device

Warning of dangerous electrical voltage levels

1.5. Advisory signs

Advisory signs draw attention to important information regarding the way the chain hoist should be handled by the operator/user. Failing to observe such advice could result in serious injury or even death as well as considerable damage to the devices themselves.

Special information and instructions for the handling of the chain hoist

2. Safety instructions, intended use

The safety instructions apply to the software as well as to the entire system.

2.1. General

- Observe the operating instructions of the system and the safety information listed there.
- This system is designed to control professional kinetic stage systems. Use for other purposes is prohibited. It has to be operated by experienced and authorized system operators trained by the manufacturer only.
- Read the instructions in this manual carefully, as they contain important information about installation, operation, and, in particular, safety.
- This manual is to be used without fall in the event of sale, transfer or instruction of additional operators to ensure that new users of the system are fully informed on the operation and safety instructions.
- The system may only be put into operation by persons of legal age. Minors may not handle this system in any way.
- Electrical work required for installation and maintenance of the plant has to be performed by a qualified technician/electrician or by properly trained personnel.
- The system must be protected from moisture, dust and high temperatures:
    - Prevention of ambient temperatures of 0 - 50° C and above
    - Protection against penetration of liquids or metallic objects and dust
    - Care during closure of system parts such as control cabinets, panels and terminal boxes
- In the event of severe malfunctions, the system is to be shut down or brought into to a safe state. In this case, it is essential to contact the manufacturer's service.
- Devices must not be opened. There are no internal parts that can be repaired by the user.
- Equipment must not be disassembled or modified.
- Never attempt to repair equipment yourself.

2.2. System safety

The control system in conjunction with the I-MOTION-Software and the V-MOTION, V-MOTION-E, NDB, NMB, EXPERT-T und BASIC system components fulfil the standards of EN 61508, SIL 1 to SIL 3 (depending on the technical equipment), and is therefore also suitable for scenic, kinetic movements over people when the stage is fully extended. Since the control with the connected drives, controllers and networking components makes up a system, it is essential that all connected

components are tested according to their purpose and the specifications and output all signals required by the I-Motion software. If this is not the case, then the entire system, and thus the control, is not to be considered as a safety-related system in accordance with the provisions of EN 61508 and the corresponding SIL level (1-3).

Rule: the weakest link in the chain determines the level of security classification.

Accordingly, all slings and suspension points used are to be considered. The selection and design of all supporting elements (e.g. suspension points, beam clamps, shackles, steel wire ropes, slings, trusses, etc.) in the flux must be done under consideration of the hazards and stresses occurring in each case (see BGI 810-3). In addition, dynamic factors, particularly in high-speed drives (>10 m/min) are to be observed and used in calculations.

Please observe:

The operator always has the overall responsibility for the system he or she operates. He or she has to familiarize him- or herself with the relevant and applicable guidelines and comply with them. Therefore, we recommend to create a risk assessment for each system configuration that is being used, and accordingly, to determine necessary safety standards for the individual components, the entire system and also for the movement parameters to be programmed and to record these in writing.

Possible laws, standards and codes that might be applicable:

- DGUV-V17/18 (BGV C1 / GUV-V C1)
- DIN 56950-3:2015-12
- DGUV-V54/55 (BGV D8 / GUV-V D8)
- igvw SQ P2
- DIN EN 61058 SIL 1 to SIL 3
- DIN EN ISO 13849-1
- DIN EN 60204-32
- DGUV I215-310 (BGI 810-0)
- DGUV I215-313 (BGI 810-3)
- GUV-I 8636

The basis for the assembly and disassembly and operation is, as always, based on the degree of hazard (risk analysis) which is created by the operator.

Furthermore, all specific country regulations and planning requirements are to be observed.

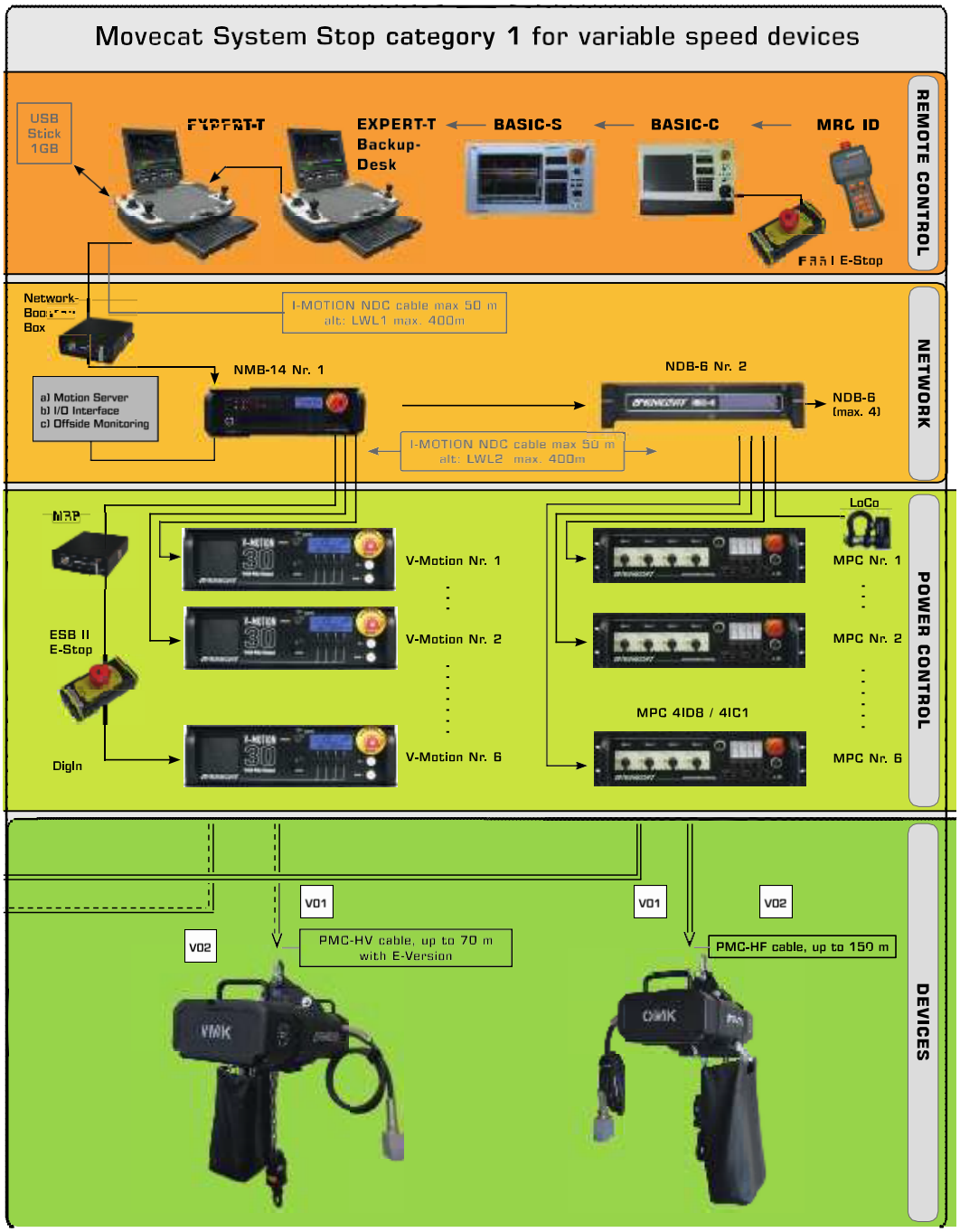
2.3. Power Supply

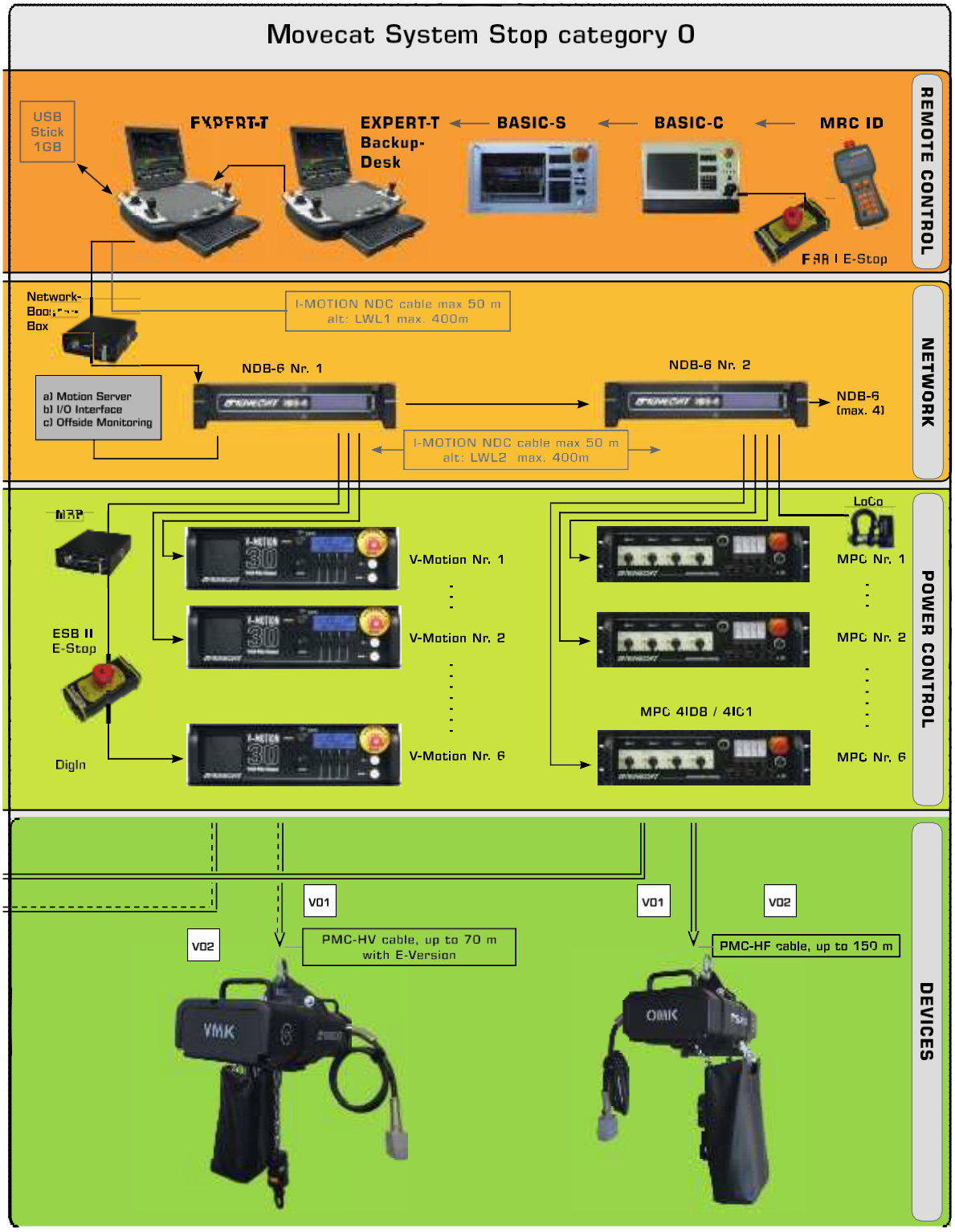
According to VDE 0100 Part 722, in the case of temporary installations a residual current device (RCD) must be included in the supply circuit. It has to be noted that to ensure optimal personnel protection when the device is used in a temporary installation, a suitable residual current device with a tripping current of max. 30 mA must be present in the upstream supply cabinet or power distributor.

2.4. Indended use

The devices are build as network distribution and controlling units within the I-Motion Network. They are not to be operated in any other application as described in chapter 1.5.

2.5. System configuration of I-Motion-Network




Movecat System Stop category 0
REMOTE CONTROL
USB Stick 1GB
EXPERT-T
EXPERT-T Backup-Desk
BASIC-S
BASIC-C
MRC ID
FAR I E-Stop
NETWORK
Network-Booster-Box
I-MOTION NDC cable max 50 m alt: LWL1 max. 400m
NDB-6 Nr. 1
NDB-6 Nr. 2
NDB-6 (max. 4)
a) Motion Server
b) I/O Interface
c) Offside Monitoring
I-MOTION NDC cable max 50 m alt: LWL2 max. 400m
POWER CONTROL
NRP
LoCo
V-Motion Nr. 1
V-Motion Nr. 2
V-Motion Nr. 6
MPC Nr. 1
MPC Nr. 2
MPC Nr. 6
MPC 4IDB / 4IC1
ESB II E-Stop
DigIn
DEVICES
V01
V02
PMC-HV cable, up to 70 m with E-Version
PMC-HF cable, up to 150 m
VMK
OMK

2.6. Deployment and usage of lifting devices / point hoists according to DGUV V17/18 and DIN 56950-3:2015-12

Please check which kind of stop category is required according the individual risk analysis (which depends on the specific application) prior to any operation of the whole system!

2.6.1. Stop-Category in case of emergency stop

In accordance to DIN 56950 there are two categories for emergency-stops:

Stop-Category 0

in accordance to EN 60204-1 – done with MOVEKET I-Motion NDB-6

Stopping all devices at once by taking of power, all brakes (or other mechanical features to stop the motion) fall in immediately.

This is used to all fixed speed as well to all variable speed devices in one common network system without retarded emergency stop signal.

Stop-Category 1

in accordance to EN 60204-1 – done with MOVEKET I-Motion NMB-14

A controlled stop mechanism is provided, Power supply to all devices is granted to ensure controlled stop situation. Power supply is switched off after all devices stopped.

Variable speed hoists can do a deceleration ramp, in case of emergency stop this deceleration ramp is shortened and controlled by at least one NMB (Network-Master-Box with integrated retarding modul) in the network, in combination with V-Motions. After this controlled emergency stop done by deceleration ramp the power supply of the hoists is taken off.

The maximum accident factor (maximum dynamic factor) is caused by lowering the load with full speed and having a power off situation!

2.6.2. SIL Category

The SIL-Category depends on the topology of the installed network and the distinct capabilities of the components used!

SIL Level 1 – done with NDB-6

If you only use NDB-6 your SIL Level never exceeds 1

SIL Level 3 – done with NMB-14

Only a NMB-14 as master in a network topology will raise the SIL category up to level 3

3. NMB-14

3.1. Overview

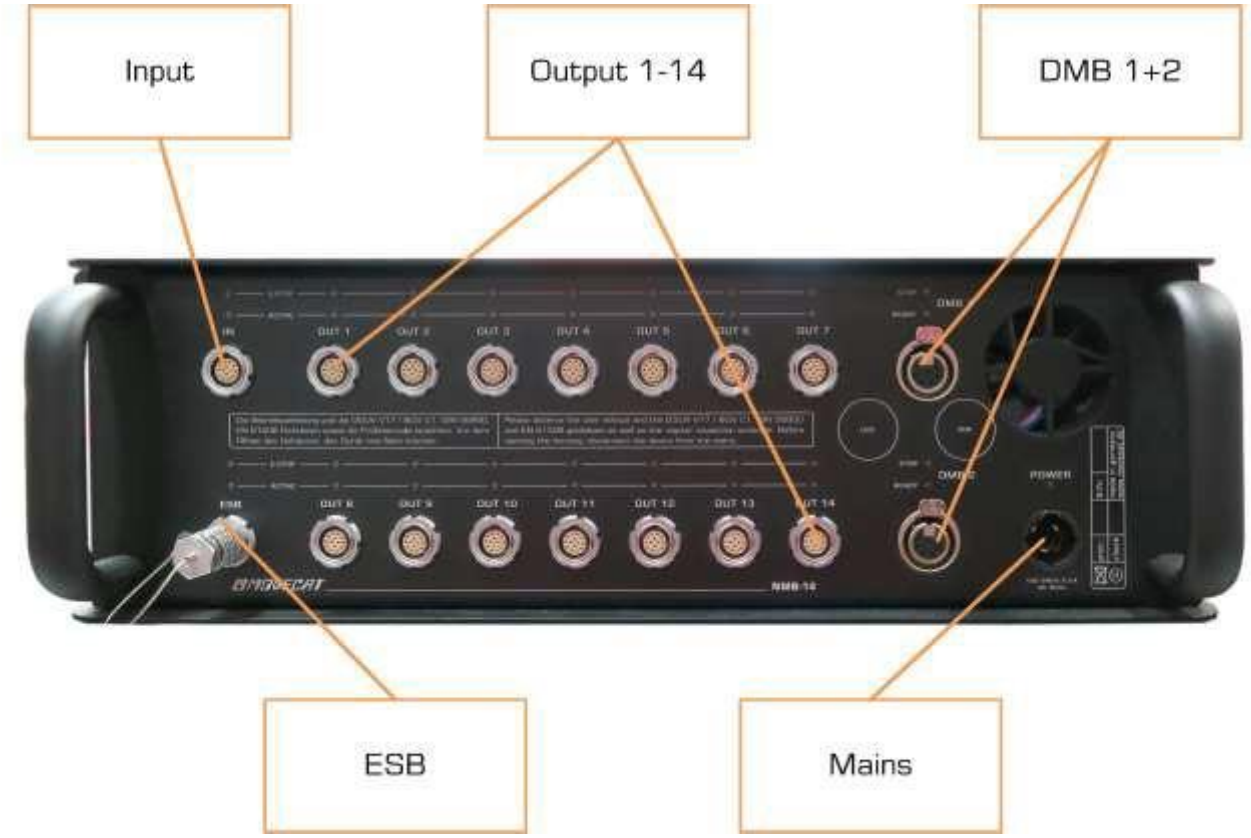
The NMB has to be used, as the name indicates, as the MASTER of the I-Motion network only.

The NMB configures itself on every start-up. There is no way (and need) for a user to configure or customize anything.

The unit is equipped with a CPU/SFU combination for signal processing.

Each of the 14 NDC outlets has its own CAN Generator.

3.2. Backside / Connectors



ESB	For connection of a ESB-2 Emergency-Switch-Button. Needs to be terminated if not connected
Input	For connecting desks into the networks
Output	For connecting V-Motions, MPC or NDB-6
DMB	For connection of DMB switches into the network
Mains	Powercon in (230V/50Hz), for Pin Allocation see the Appendix

Please ensure, that the earthing of the mains is on the same potential as the rest of the machinery!

3.3. Front side

Emergency stop	emergency stop chain of all connected devices (via I-Motion Network) gets interrupted
Power switch	powers the unit on or off

The Menu/Save/UP/DWN knobs do not have a functionality yet.

3.3.1. LEDs

POWER

FAIL (red)	If Mains not present
READY (green)	If Mains present

USV

ON (yellow)	In case of a power fail
READY (green)	If USV is charged and ready to take action

C-UNIT (CPU / SFU)

Red	Error
Green	Started and ready for operation

S-FDB

FAIL (red)	Error at the E-Stop relay
READY (green)	E-Stop relay ready for operation

E-STOP (IN / OUT)

Red	Error / E-Stop activated
Gren	No E-Stop activated

ESB

E-STOP (red)	E-Stop chain interrupted / e-stop-button pressed
READY (green)	E-Stop chain not interrupted

DMB1 / DMB2

STOP (yellow)	DMB does not approved operation
Ready (green)	DMB does approve operation

GO

1 (green)	GO command from first desk active
2 (green)	GO command from second desk active

3.3.2. Display

Upper rows (1+2): 0 if nothing is connected, 1 if the output is connected

DMB: indicates if Dead-Man-Buttons are connected.

You can connect 2 DMB to the NMB-14. The first numeric show the status of the first backside connector, the second numeric for the second connector

0: Not present
1: Present,
2: Button is half-pressed - operation is approved.

For further information please see chapter 2.4.

ESB: Indicates the status of the Emergency-Stop-Button (ESB) which is connected to the ESB connector on the back

1: Button present and not pressed OR Button not connected
2: Button present and pressed

Life sign: Rotates when device is active

3.4. Working with DMB

A Dead-Man-Button (DMB) can be used in situations where the operator cannot ensure by himself that he is overlooking everything or an approval of a different person is needed to operate the system safely.

To use one, just plug it into one of the DMB jacks on the back.

The DMB has 3 switching positions:

- Not pressed or fully pressed: Operation is not approved
- Half-pressed: Operation is approved

3.5. E-Stop ramp

As mentioned before, the NMB-14 stops the entire connected system in case of an E-stop (pushing a E-stop somewhere in the network, software E-stop etc.) with a special E-Stop ramp corresponding to the configured drive. The alteration of this ramp can only be done by administrators and has to be confer with MOVEKET.

3.6. Troubleshooting

At first, if you have any problems, please ensure that all cables you are using are fully functional.

Any error described here can also be just a faulty cable!

C-Unit error: Check if desk is connected correctly and the I-Motion software is running on the desk

ESB error: Check if

a. All E-Stop buttons are not pressed
b. If not using a ESB, if the terminator is plugged into the NMB14

3.7. Additional equipment

3.7.1. MOVEKET ESB-2 (#400353)

External emergency stop-box, incl. stop-button. To be connected somewhere in the network or at the special ESB jack of the NMB-14.

3.7.2. MOVEKET DMB C1-5 (#400401)

External enable switch (dead man button) for SIL3 applications with 5 meters cable length.

To be connected to the NMB-14 DMB jacks.

4. NDB-6

4.1. General

There is a self-configuration module inside all NDB-6 devices for the network configuration. There is no need and no way for the user to configure or customize anything using these components.

The "first" NDB-6, connected to a remote control desk will configure itself as Master

All other NDB-6 , connected to the "first" NDB-6 or other NDB-6 or a NMB-14 configure themselves as SLAVE.

Power supply is given by any V-Motion / MPC connected to NDB-6 (maximum cascade of NDB-6 powered by one V-Motion / MPC is 3!).

Channel 1+2 or 3+4 or 5+6 are combined to the same CANBUS generator, so each NDB-6 has got 6 outputs but 3 CANBUS generators (maximum cascades of NDB-6 is 4, maximum cable length of NDC cables between devices is 50m)

4.2. Back side

IN: INPUT - connect to a MOVEKET control desk or NMB-14 or to another NDB-6 (any output)

OUT: Output - connect to V-MOTION or connect to another NDB-6

LEDs: Active (below each output): Power by V-MOTION active

CPU: CPU is active
POWER: internal CPU is active

4.3. Front side

The displayed values differ depending on the mode the NDB-6 is running.

4.3.1. Master configuration

First row:	MS =	MASTER configuration
	V100 =	Software version
	UDP =	shown when UDP connection to control desk is fine
	Checks above =	the first desk is connected
	Left check =	processor is online
	Right check =	joy control is online
	Checks below =	a second desk is connected
	Left 1/0=	dead man function at joystick or GO-button is active at first desk
	Life sign =	rotation when internal CPU is working fine
	Right 0/1=	dead man function at joystick or GO-button is active at second desk

Second row:	Check left =	Output 1 or 2 is active
	Check middle =	Output 3 or 4 is active
	Check right =	Output 5 or 6 is active

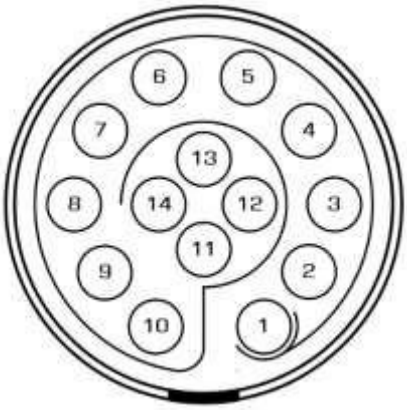
4.3.2. Slave configuration

First row:	SL =	SLAVE configuration
	V100 =	Software version
	Life sign =	Rotation when internal CPU is working fine

Second row:	Check left =	Input connection to other NDB-6 is fine
	Check middle left =	Output 1 or 2 is active
	Check middle right =	Output 3 or 4 is active
	Check right =	Output 5 or 6 is active
	Sync live sign =	Rotation assigns CANBUS synchronization is fine

5. Pin Allocation

5.1. NDC (Network Data Cable)



Seen from the solder-sider of the connector!

NDC	Colour	Signal
1	red	P24
2	black	GND
3	white	ESTOPIN 1
4	brown	ESTOPIN 2
5	green	ESTOPOUT1
6	yellow	ESTOPOUT2
7	white/blue	GO1
8	blue	GO2
9	white/brown	CANH
10	brown	CANL
11	white/orange	RX+
12	orange	RX-
13	white/green	TX+
14	green	TX-

5.2. DMB

XLR 7-pole	Colour
1	bridge to PIN 3
2	blue
3	bridge to PIN 1
4	red
5	n.c.
6	white
7	n.c.