

Rittal – The System.

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**NH measurement module
LCD display for monitoring
Power pack for display and ModBus**



SV9343.070	SV9343.170
SV9343.270	SV9343.370
SV9343.400	SV9343.410

Assembly and operating instructions

ENCLOSURES

POWER DISTRIBUTION

CLIMATE CONTROL

IT INFRASTRUCTURE

SOFTWARE & SERVICES

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1 Notes on documentation

1.1 General information

The designation NH measurement module describes the associated NH measurement module in the appropriate size NH00, 1, 2 or 3.

The designation CMC III PU is the abbreviation for CMC III Processing Unit and CMC III Processing Unit Compact. If only one of these products is involved, this is indicated appropriately.

Software displays the NH measurement module, in particular in the CMC III PU, with the abbreviation SES (Smart Energy System).

1.2 CE label

Rittal GmbH & Co. KG confirms the conformity of the NH measurement module with the low-voltage regulation 2014/35/EU and with the EMC directive 2014/30/EU. A corresponding declaration of conformity has been issued and can be downloaded from the Rittal home page.



1.3 Storing the documents

The assembly and operating instructions as well as all other applicable documents are an integral part of the product. They must be issued to everyone who works with the unit and must always be available and on hand for the operating and maintenance personnel.

1.4 Symbols used in these operating instructions

The following symbols are used in this documentation:



Danger!

Hazardous situation which will result in death or serious injury if the instructions are not followed.



Warning!

Hazardous situation which may lead to death or serious injury if the instructions are not followed.



Caution!

Hazardous situation which may lead to (minor) injuries if the instructions are not followed.



Note:

Identification of situations that can lead to material damage.

- This symbol indicates an "action point" and shows that you should perform an operation or procedure.

1.5 Associated documents

- NH measurement module assembly instructions
- CMC III Processing Unit / CMC III Processing Unit Compact assembly, installation and operating instructions



Note:
The associated documents can be downloaded from the <http://rittal.com> home page.

2 Safety instructions

Safety instructions and warnings Rittal components for power distribution Mini-PLS/RiLine/Ri4Power



Revision: R00/Document no.: D-0000 00000 518

Hazards and their prevention according to IEC 60417/ISO 7000/ISO 7010		Product life cycle			
DANGER	 			 	
WARNING	 	 	 		
CAUTION	 		 		

DE Arbeiten an elektrischen Anlagen dürfen nur von einer Elektrofachkraft (gemäß EN 50110) oder von unterwiesenem Personal unter Leitung und Aufsicht einer Elektrofachkraft vorgenommen werden! Die bestimmungsgemäße Verwendung dieser Komponente(n) ist die Nutzung in Niederspannungsanlagen im Rahmen der Niederspannungsrichtlinie 2014/35/EU und ausschließlich in Verbindung mit Rittal Eigen- sowie von Rittal freigegebene Fremdkomponenten innerhalb der in der Betriebsanleitung beschriebenen Systeme Mini-PLS, RiLine und Ri4Power erlaubt. Der Betrieb ist nur innerhalb der angegebenen Leistungsgrenzen zulässig.

EN Work on electrical equipment must only be carried out by a skilled electrician (according to EN 50110) or by trained personnel under the management and supervision of a skilled electrician! The approved use of the component(s) in low-voltage systems is in line with Low Voltage Directive 2014/35/EU and in exclusive connection with Rittal-branded components or third-party components approved by Rittal in Mini-PLS, RiLine and Ri4Power systems as described in the operating instructions. Operation is only permissible within the capacity limits stated.

FR Toutes les interventions à réaliser sur les installations électriques doivent être exécutées exclusivement par un électricien (conformément à la norme EN 50110) ou par une personne formée sous la direction et la surveillance d'un électricien ! L'utilisation conforme de ce(s) composant(s) s'effectue dans les installations basse tension dans le cadre de la directive basse tension 2014/35/UE et exclusivement en association avec des composants Rittal ou des composants étrangers validés par Rittal pour les systèmes Mini-PLS, RiLine et Ri4Power décrits dans la notice d'utilisation. Seul le fonctionnement dans les plages de puissance indiquées est autorisé.

NL Werkzaamheden aan elektrische installaties mogen uitsluitend door bevoegd elektrotechnisch personeel (conform EN 50110) of opgeleid personeel onder leiding en toezicht van bevoegd elektrotechnisch personeel worden uitgevoerd. Het met de bestemming overeenkomende gebruik van deze component(en) is het gebruik in laagspanningsinstallaties conform de laagspanningsrichtlijn 2014/35/EU, uitsluitend in combinatie met eigen componenten van Rittal en door Rittal vrijgegeven componenten van derden binnen de in de gebruiksaanwijzing omschreven systemen Mini-PLS, RiLine en Ri4Power. Het gebruik is uitsluitend toegestaan binnen de aangegeven vermogensgrenzen.

SE Arbeten på elektriska anläggningar får endast utföras av en behörig elektriker (motsvarande EN 50110) eller av instruerad personal under ledning och översyn av en elektriker! Denna komponent/ dessa komponenter är föreskriftsmässigt avsedda att användas i lågspänningsanläggningar inom ramen för lågspänningsdirektivet 2014/35/EU, och uteslutande i kombination med Rittals egna samt av Rittal godkända tredjepartskomponenter i systemen Mini-PLS, RiLine och Ri4Power som beskrivs i bruksanvisningen. Drift får endast ske inom de angivna effektgränserna.

IT I lavori sull'impianto elettrico devono essere eseguiti esclusivamente da persona esperta (PES) (in conformità alla norma EN 50110) o da persona avvertita (PAV) dietro supervisione della persona esperta. Conformità: questi componenti sono progettati per essere utilizzati negli impianti in bassa tensione secondo quanto previsto dalla direttiva Bassa Tensione 2014/35/UE e solo in combinazione con componenti Rittal o di terze parti approvati da Rittal all'interno dei sistemi Mini-PLS, RiLine e Ri4Power riportati nel manuale di istruzioni. L'utilizzo è consentito solo entro i limiti di potenza specificati.

ES Los trabajos en una instalación eléctrica (según EN 50110) deben ser realizados sólo por personal técnico o por personal autorizado bajo la supervisión de un técnico. El uso previsto de estos componentes es para instalaciones de baja tensión en el marco de la Directiva de baja tensión 2014/35/CE y exclusivamente en combinación con componentes propios de Rittal o componentes de otros fabricantes autorizados dentro de los sistemas PLS-Mini, RiLine y Ri4Power descritos en el manual de funcionamiento. El funcionamiento está autorizado únicamente dentro de los límites de potencia indicados.

FI Sähkölaitteille saavat suorittaa töitä vain sähköalan ammattilaiset (EN 50110 -standardin mukaisesti) tai perehdytetyt henkilöt sähköalan ammattilaisten ohjauksen ja valvonnan alaisina! Näiden komponenttien määräysten mukainen käyttö on käyttöä matalajännittdirektiivin 2014/35/EU mukaisissa matalajännitelaitteissa sekä vain Rittalin omien ja Rittalin hyväksymien kolmansien osapuolten komponenttien kanssa käyttöohjeissa kuvatussa Mini-PLS-, RiLine- ja Ri4Power-järjestelmissä. Käyttö on sallittua vain mainituissa tehorojoissa.

DK Udførelse af elektriske installationer må kun foretages af en autoriseret el-installatør i henhold til (EN 50110) eller af andet uddannet personale under ledelse/opsyn af en autoriseret el-installatør. Den tilsligtede anvendelse i brugen af komponenter i lavspændingsystemer skal være inden for rammerne af lavspændingsdirektivet 2014/35/EU. Disse er udelukkende tilladt i forbindelse

2 Safety instructions

EN

med Rittal komponenter eller af Rittal godkendte tredjeparts komponenter som beskrevet i brugervejledningen for systemer såsom Mini-PLS, RiLine samt Ri4Power. Brugen er kun tilladt inden for de angivne effektivitetsbegrensninger.

IE I gcomhráir le EN 50110, níor cheart d'aon duine seachas leictreoir oílte, nó pearsanra oílte faoi bhainisteoiréacht agus maoirseacht leictreora oílte, obair a dhéanamh ar threalamh leictreach! Tá an chompháirt/na compháirteanna formheasta i gcomhair úsáide i gcórais ísealvoltais i gcomhréir leis an Treoir 2014/35/AE maidir le hisealvoltais agus ní ceadmhach iad a úsáid ach anháin i dtaca le compháirteanna Rittal-bhrandáilte nó compháirteanna tríú páirtí a bhfuil formheas faighte ina dtaobh ó Rittal i gcórais Mini-PLS, RiLine agus Ri4Power de réir mar a thuariscítear sna treoracha oibrúcháin. Ní cheadaítear oibriú ach anháin laistigh de na teorainneacha acmhainne a shonraítear.

PL Prace przy urządzeniach elektrycznych mogą być wykonywane wyłącznie przez elektryków (wg EN 50110) lub przez przeszkolony personel pod kierownictwem i nadzorem elektryka. Użycie zgodne z przeznaczeniem tylko w instalacjach niskiego napięcia w ramach dyrektywy niskonapięciowej 2014/35/WE. Dozwolone wyłączenie w połączeniu z własnymi oraz z dopuszczonymi przez Rittal komponentami innych producentów w ramach opisanych w instrukcji eksploatacji systemów Mini-PLS, RiLine i Ri4Power. Użytkowanie jest dozwolone tylko w podanym zakresie mocy.

CZ Práce na elektrických zařízeních smí provádět jen kvalifikovaný elektrikář (podle normy ČSN EN 50110) nebo zaškolený personál pod vedením a dozorem kvalifikovaného elektrikáře! Použití tohoto komponentu (těchto komponentů) je dovoleno v souladu se stanoveným účelem, který odpovídá použití v niskonapěťových zařízeních v rámci směrnice o nízkém napětí 2014/35/EU a výhradně ve spojení s vlastními komponenty společnosti Rittal a komponenty cizích výrobců, které schválila společnost Rittal, v systémech Mini-PLS, RiLine a Ri4Power, definovaných v provozním návodu. Provoz je přípustný jen v uvedených mezích výkonu.

BG Дейностите по електрическите съоръжения трябва да се извършват само от специалист-електротехник (съгласно EN 50110) или от инструктиран персонал под ръководството и надзора на специалист-електротехник! Употребата по предназначение на този компонент(и) е използването му в съоръжения с ниско напрежение в рамките на Директива 2014/35/ЕС относно инсталации за ниско напрежение и е разрешено само с компоненти на Rittal или с одобрени от Rittal компоненти, произведени на трети страни, описани в ръководството за експлоатация на системи Mini-PLS, RiLine и Ri4Power. Експлоатацията е разрешена само в рамките на посочените мощности.

RU Работы на электроустановках допускаются проводить только специалистам по электрике (согл. EN 50110) или обученному персоналу под надзором специалистов по электрике! Назначением данного компонента (компонентов) является использование в низковольтных комплектных устройствах в соответствии с директивой по низковольтному оборудованию 2014/35/ЕU, а также исключительно в сочетании с собственными компонентами Rittal и одобренными Rittal сторонними компонентами, в рамках описанных в руководстве по эксплуатации систем Mini-PLS, RiLine и Ri4Power. Эксплуатация допускается только в рамках указанного диапазона мощности.

GR Οι εργασίες σε ηλεκτρικές εγκαταστάσεις επιτρέπεται να εκτελούνται μόνον από εκπαιδευμένο ηλεκτρολόγο (σύμφωνα με το EN 50110) ή από προσωπικό που έχει λάβει σχετική ενμέρωση και εργάζεται υπό τη διεύθυνση και επίβλεψη ηλεκτρολόγου! Προβλεπόμενη θεωρείται η χρήση αυτού(ών) του(των) εξαρτήματος(ων) σε εγκαταστάσεις χαμηλής τάσης, όπως ορίζεται στην Οδηγία Χαμηλής Τάσης 2014/35/ΕΕ, και αποκλειστικά σε συνδυασμό με παρελκόμενα εξαρτήματα της Rittal ή εξαρτήματα άλλων κατασκευαστών που έχουν εγκριθεί από την Rittal για χρήση εντός των συστημάτων Mini-PLS, RiLine και Ri4Power που περιγράφονται στις οδηγίες λειτουργίας. Η λειτουργία επιτρέπεται μόνον εντός των αναφερόμενων ορίων ισχύος.

RO Lucrările la instalațiile electrice pot fi realizate numai de un electrician calificat (conform EN 50110) sau de personal instruit, sub îndrumarea și supravegherea unui electrician calificat! Utilizarea conformă cu destinația a acestor componente este folosirea în instalații de joasă tensiune, în temeiul Directivei pentru joasă tensiune 2014/35/UE și este permisă exclusiv în legătură cu componentele proprii Rittal, precum și cu componentele externe autorizate de Rittal. În cadrul sistemelor descrise în manualul de utilizare, Mini-PLS, RiLine și Ri4Power. Operarea este permisă numai între limitele de putere specificate.

HR Radove na elektroinstalacijama smije provoditi samo elektrotehničar (sukladno normi EN 50110) ili kvalificirano osoblje pod nadzorom elektroteh-

ničara! Namjenska uporaba tih komponenti je uporaba na niskonaponskim instalacijama sukladno Direktivi o električnoj opremi namijenjenoj za uporabu unutar određenih naponskih granica 2014/35/EU i isključivo s komponentama tvrtke Rittal ili komponentama drugog proizvođača koje je tvrtka Rittal odobrila te su navedene u uputama za uporabu opisanih sustava Mini-PLS, RiLine i Ri4Power. Rad je dozvoljen samo unutar navedenih ograničenja učinkovitosti.

HU Az elektromos berendezéseken és eszközökön történő munkavégzést csak (az EN 50110 szerinti) elektromos szakember, vagy elektromos szakember vezetésével és felügyelete mellett dolgozó beosztott véggezhet! Ezeknek a komponenseknek a rendeltetésszerű használata a 2014/35/EU kifizetésű berendezésekre vonatkozó irányelv szerinti kifizetésű berendezésekben történő felhasználás, és kizárólag a Rittal saját gyártmányú, illetve a Rittal által jóváhagyott más gyártmányú komponensekkel együtt, az üzemeltetési kézikönyvben leírt Mini-PLS, RiLine és Ri4Power rendszerekben történő alkalmazás megengedett. Az üzemeltetés csak a megadott teljesítményhatárokon belül megengedett.

LT Darbus su elektriniomis įrenginiais gali atlikti tik kvalifikuotas elektrikas (pagal EN 50110) arba apmokyti darbuotojai vadovaujant ir prižiūrint kvalifikuotam elektrikui! Šis (-ie) komponentas (-ai) yra naudojamas žemos įtampos įrenginiuose vadovaujantis žemos įtampos direktyva 2014/35/ES ir tik kartu su „Rittal“ komponentais arba „Rittal“ patvirtintais kitais komponentais, aprašytais „Mini-PLS“, „RiLine“ ir „Ri4Power“ sistemų naudojimosi instrukcijoje. Galima eksploatuoti tik nurodytame galios diapazone.

EE Elektriseadmetega tohivad töötada ainult kvalifitseeritud spetsialistid (standardi EN 50110 järgi) või teised töötajad nende juhtimise ja järelevalve all! Komponenti/komponentide kasutamine kirjeldatud süsteemides on lubatud kooskõlas madalpingedirektiiviga 2014/35/EL ja üksnes Rittal'i või Rittal'i poolt heakskiidetud komponentidega kasutusjuhendi järgi. Mini-PLS, RiLine ja Ri4Power. Käitamine on lubatud ainult määratud võimsuste apires.

LV Darbus ar elektroiekārtām drīkst veikt tikai elektriķi (saskaņā ar standartu EN 50110) vai apmācīti darbinieki elektriķa vadībā un uzraudzībā! Šos komponentus ir paredzēts lietot zemsprieguma iekārtās saskaņā ar Zemsprieguma direktīvu 2014/35/ES un tikai kopā ar Rittal ražotajiem vai Rittal atļautajiem citu ražotāju komponentiem lietošanas instrukcijā aprakstītajās sistēmās Mini-PLS, RiLine un Ri4Power. Eksploatacija ir atļauta tikai norādītajā jaudas diapazonā.

SI Dela na električnih inštalacijah lahko izvajajo samo usposobljeni strokovnjaki za elektrotehnična dela (v skladu s standardom EN 50110) ali izučeno osebo pod vodstvom in nadzorom usposobljenih strokovnjakov za elektrotehnična dela! Te komponente so namenjene uporabi v niskonapetostnih inštalacijah v skladu z direktivo 2014/35/EU o električni opremi, ki je načrtovana za uporabo znotraj določenih napetostnih mej. Uporaba je dovoljena izključno v povezavi s komponentami podjetja Rittal in drugimi komponentami, ki jih je odobril podjetje Rittal, v sistemih Mini-PLS, RiLine in Ri4Power, opisanih v navodilih za uporabo. Dovoljeno je samo obratovanje znotraj navedenih mej zmogljivosti.

SK Práce na elektrických zariadeniach smie vykonávať len kvalifikovaný elektrikár (podľa EN 50110) alebo vyškolený personál pod vedením a dohľadom kvalifikovaného elektrikára! Túto súčiastku (tieto súčiastky) je možné používať len v súlade s určením, t. j. v niskonapäťových systémoch v rámci smernice o nízkom napätí 2014/35/EU a výlučne v spojení so súčiastkami Rittal alebo súčiastkami tretích strán, ktoré schválila spoločnosť Rittal, v rámci systémov Mini-PLS, RiLine a Ri4Power, opisanych v návode na použitie. Prevádzka je povolená len v rámci stanovených výkonových limitov.

PT O trabalho efetuado em sistemas elétricos deve ser feito por electricistas autorizados e especializados (de acordo com a norma EN 50110) ou por técnicos trabalhando sob supervisão! O(s) componente(s) podem ser utilizados em instalações de distribuição elétrica de baixa tensão que atendem à diretiva da União Europeia 2014/35/UE que regulamenta esses equipamentos e apenas com produtos próprios da Rittal ou de outras marcas aprovadas pela Rittal para uso nos sistemas Mini-PLS, RiLine e Ri4Power, conforme especificado no devido manual de instalação. Somente é permitido utilizar o equipamento na faixa de potência permitida.

MT Xoghfol fuq apparat tal-eletriku jista' jsir biss minn elektrixin imharreg (skont EN 50110) jew minn persunal imharreg taht il-gestjoni u s-supervizzjoni ta' elektrixin imharreg! L-uzu approvat tal-komponent(i) huwa f'sistemi ta' vultagg baxx b'mod konformi tad-Direttiva dwar il-Vultagg Baxx 2013/35/UE u b'raba esklussiva ma' komponenti tad-ditta Rittal jew ma' komponenti ta' parti terza approvati minn sistemi ta' Rittal Mini-PLS, RiLine u Ri4Power kif deskritt fl-istruzzjonijiet dwar it-thaddim. It-thaddim jista' jsir biss fil-limiti tal-kapacità ddikjarata.

R00/D-0000 00000 518

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ENCLOSURES POWER DISTRIBUTION CLIMATE CONTROL IT INFRASTRUCTURE SOFTWARE & SERVICES

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3 Product description

3.1 Functional description

The NH measurement module is an accessories product for Rittal NH fuse-switch disconnectors for measuring, acquiring and evaluating electrical performance data.

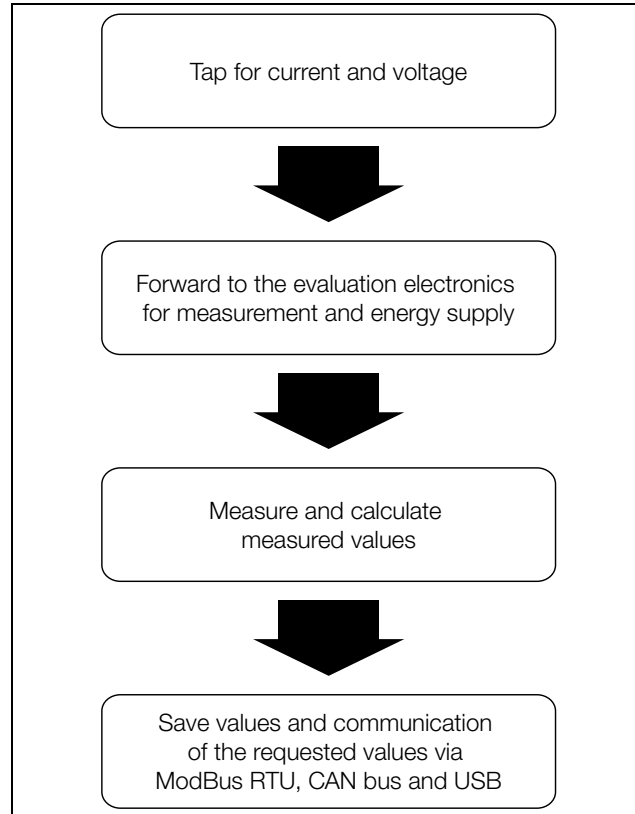


Fig. 1: NH measurement module functional description

3.2 Components

The unit consists of a base unit and a contact hazard protection cover. The base unit contains the measurement electronics, 3 power converters, 3 voltage taps (integrated), 2 status LEDs and the following connections:

- 2 x CAN bus (looped-through)
- 2 x ModBus (looped-through)
- USB connection
- 2-pole connector (N or L2+N jumper)
- 3 conductor connections (frame terminals)

The contact hazard protection cover consists of the cover, a fibre-optic conductor, a flap and an enclosed fastened USB cable.

3.3 Proper use, foreseeable misuse



Note:

The NH measurement module is a class A device that can cause radio interference in residential areas. In such cases, the operating company may be asked to implement appropriate measures.

To ensure proper use of the unit with the CMC III PU, mount the provided ferrite between the CMC III PU and the NH measurement module.

The NH measurement module in accordance with the functional description (see section 3.1 "Functional description") is an electrical testing and measuring instru-

3 Product description

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ment, and permitted for use only in the combination shown as row in the following table:

NH measurement module	Model no.	may be mounted on this item	
		Size	RiLine model no.
NH00 150 A	SV9343.070	NH00	9343.000 9343.020 9343.040
NH1 250 A	SV9343.170	NH1	9343.100 9343.120 9343.140
NH2 400 A	SV9343.270	NH2	9343.200 9343.220 9343.240
NH3 600 A	SV9343.370	NH3	9343.300 9343.320 9343.340

Tab. 1: Permitted combinations

The LCD display for monitoring (SV9343.410) is used for the configuration and the direct display of the instantaneous values and may be operated only with the associated power supply unit for the display and ModBus (SV9343.400) on all sizes of the NH measurement module.

3.4 Scope of supply

3.4.1 NH measurement module in the sizes NH00, 1, 2, 3

The SV9343.070, SV9343.170, SV9343.270, SV9343.370 items cover the following scope of supply:

- NH measurement module in the appropriate sizes NH00, 1, 2 or 3
- Shortened contact hazard protection cover
- 2-pole connector with preassembled jumper
- 2-pole connector with attached contact for the N connection
- Assembly instructions
- Safety instructions
- Second type plate with serial number
- Ferrite for use with CMC III

3.4.2 LCD display for monitoring

The SV9343.410 item covers the following scope of supply:

- LCD display with RJ 11/12 socket
- RJ 12 cable, length 2 m
- Assembly instructions
- Safety instructions

3.4.3 Power supply unit for the display and ModBus

The SV9343.400 item covers the following scope of supply:

- Power supply unit for the display and ModBus with two RJ 45 sockets, RJ 11/12 socket, 2-pole mains connection socket
- Adaptor cable with one RJ 45 connector and one RJ 45 socket
- 2-pole mains connection connector
- Assembly instructions
- Safety instructions



Note:

The supplied adaptor cable changes the pin assignment of the connectors. The adaptor must be used in accordance with the description in section 6.1 "Installation of the power supply unit for the display and ModBus".

3.5 Serial number

The serial number of the unit is required for the configuration. The serial number can be found on the type plate located on the left-hand side of the NH measurement module. The serial number can also be found on the additional type plate included with the delivery.



Note:

The serial number shown in the CMC III PU is not relevant for configuration via USB and ModBus. Please use the serial number found on the type plate.

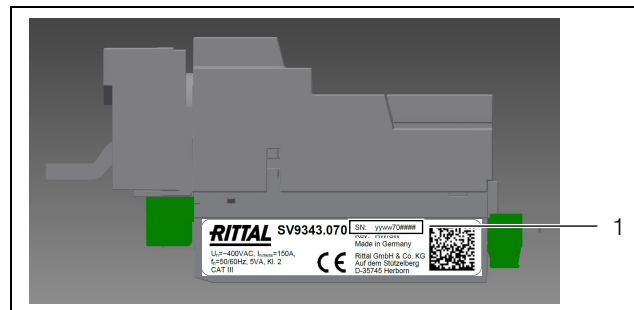


Fig. 2: Type plate

Key

- 1 Serial number position

4 NH measurement module installation and operation

The NH measurement module must be assembled in accordance with the provided assembly instructions (see section 4.2 "Assembly"), the safety instructions (see section 2 "Safety instructions") and the proper use (see section 3.3 "Proper use, foreseeable misuse").

4.1 Installation site requirements

To ensure the correct functioning of the unit, the installation site conditions for the unit specified in section 8 "Technical specifications" must be observed.

Electromagnetic interference

The unit is interference immune in accordance with EN 61000-6-2, the emitted interference in accordance with EN 61000-6-4.

4.2 Assembly

4.2.1 Connection of the NH measurement module at the NH fuse-switch disconnecter with tap-off at the bottom

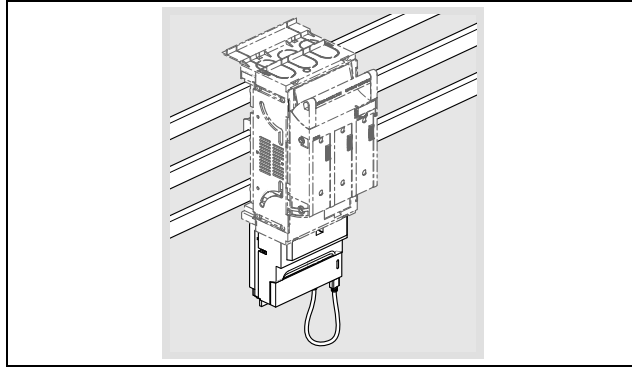


Note:

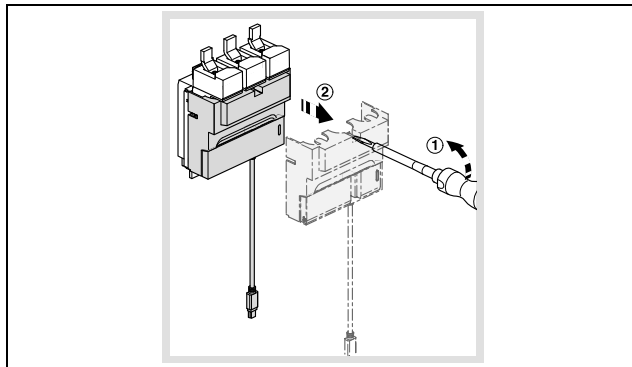
For torque details, refer to the connection terminals of the associated module.

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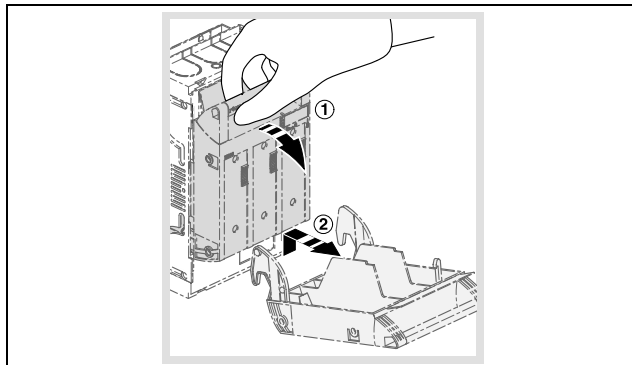
EN



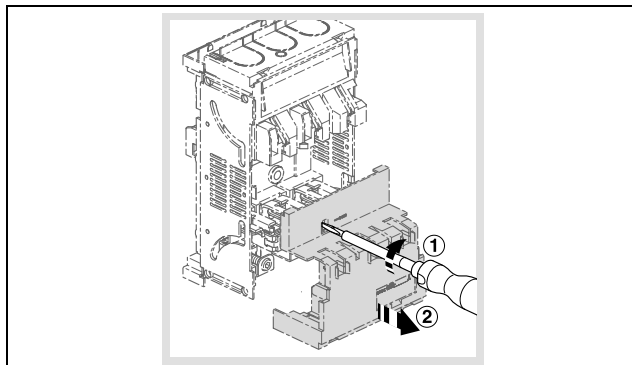
- Use a screwdriver to unlock the protective cover of the NH measurement module and remove it.



- Open the safety seating of the NH fuse-switch disconnecter and remove it.

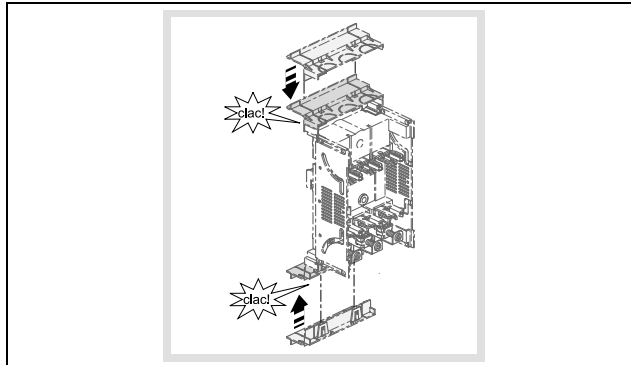


- Use a screwdriver to unlock the contact hazard protection cover and then remove it.

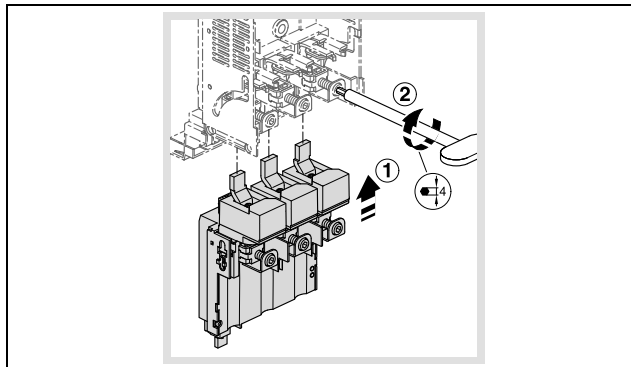


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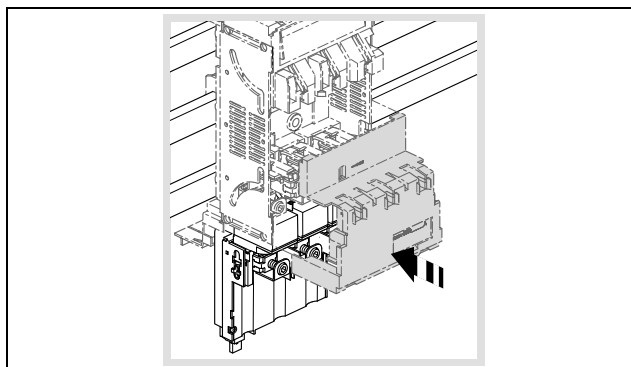
- Fasten the contact hazard protection cover by snapping-in at the top and bottom end of the NH fuse-switch disconnecter. Place the provided shortened contact hazard protection cover for the NH measurement module at the side to which it is connected.



- Push the NH measurement module with the connection conductors into the frame terminals of the NH fuse-switch disconnecter and fasten it with the prescribed tool and torque.



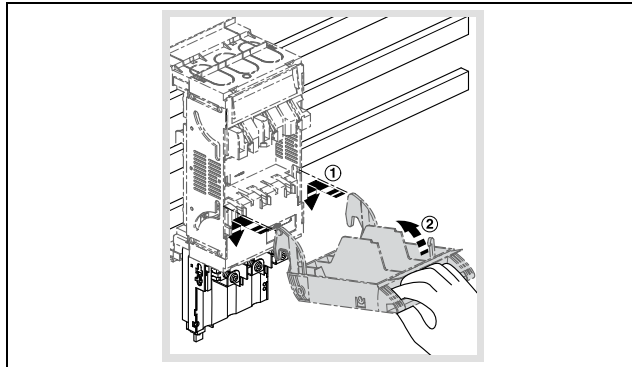
- Snap-in the contact hazard protection cover of the NH fuse-switch disconnecter.



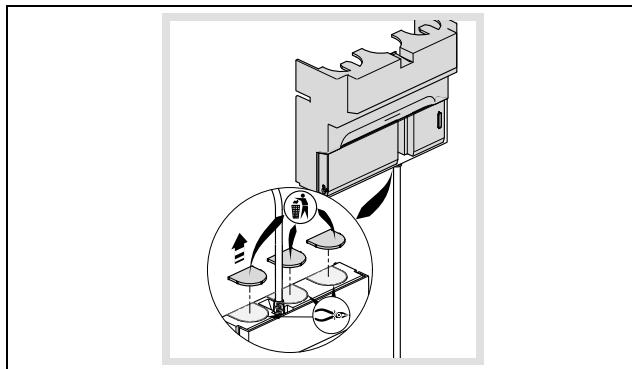
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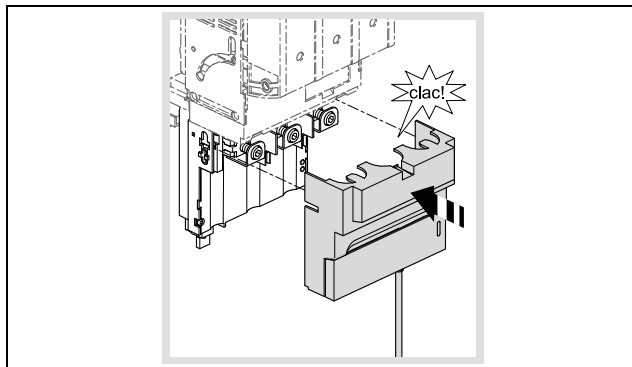
- Snap-in the safety seating of the NH fuse-switch disconnecter and close it.



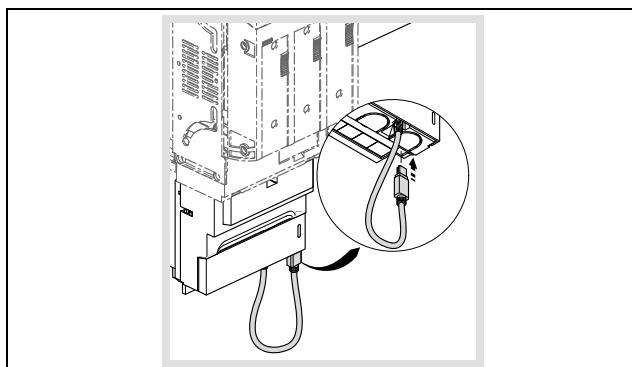
- Use an appropriate tool to break out the covers of the conductor passage at the tap-off side of the NH measurement module and dispose of them appropriately.



- After connecting the tap-off cable, snap the protective cover of the NH measurement module on again.

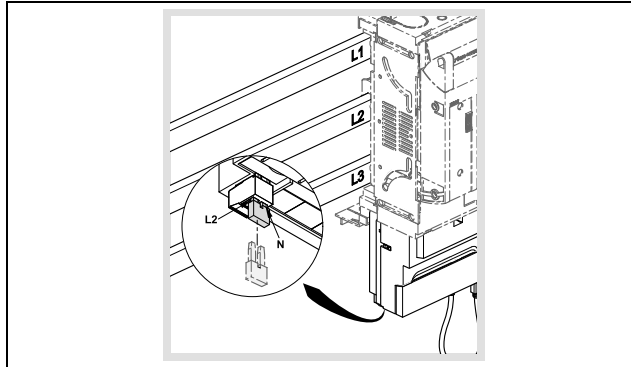


- Insert the mini-USB connector in the socket at the lower right on the NH measurement module.

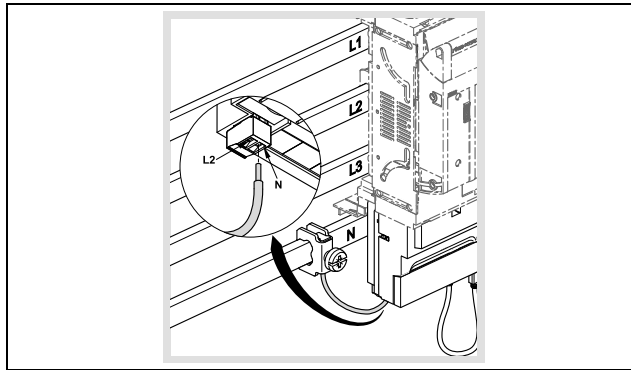


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- For a three-conductor system, you must insert the 2-pin connector provided with the 2-pin connection jumper in the socket.



- For a four-conductor system with neutral conductor, you must insert the connector without jumper and connect the connection pin marked "N" with the neutral conductor busbar using a 1.5 mm² cable.

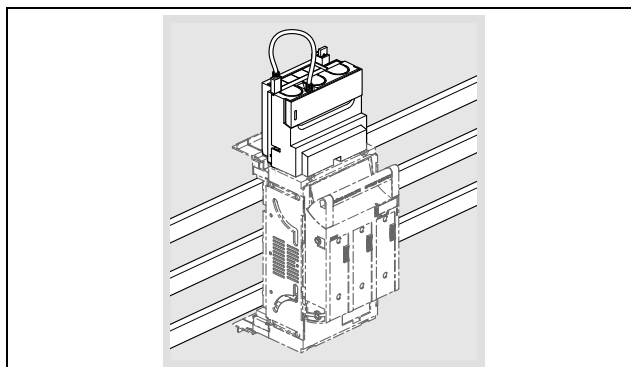


Note:

Appropriate conductor protective terminals are described in the "RiLine accessories" area of the current Rittal manual.

4.2.2 Assembly with the tap-off at the top (only size NH00)

The NH measurement module of size NH00 can also be assembled with the tap-off at the top on the NH fuse-switch disconnecter. For this assembly, the measurement module is installed turned through 180° and so L1 and L3 exchanged.



- Set this in the configuration in order to adapt the representation of the measured values appropriately (via ModBus, CMC III PU or USB).

4.3 Operation

The NH measurement module acquires the values specified in the technical specifications (see section 8.4 "Measured values") and stores them in the internal memory. The data can be fetched via the USB interface (see section 4.5 "Access

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via USB"). The instantaneous values and the stored values can be fetched with the CMC III PU via CAN bus (see section 4.7 "CMC III (CAN bus)") and via ModBus RTU (see section 5 "ModBus").



Note:

Check whether you operate the NH measurement module with 3 or 4 conductors. In 3-conductor operation, the L2 and N inputs must be jumpered (see section 4.3.1 "Control and display components"). In 4-conductor operation, the neutral conductor must be connected to connection 2 (see section 4.3.1 "Control and display components"). For this purpose, use the provided connector with only one installed contact in order to prevent a connection fault. The exact connection is shown in the assembly instructions (see section 4.2 "Assembly"). The associated operating mode must be set in the configuration via USB, CMC III PU, ModBus or the LCD display for monitoring.

4.3.1 Control and display components

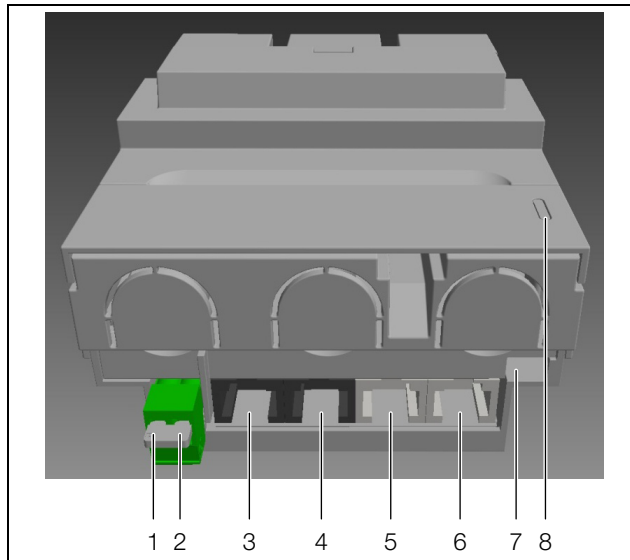


Fig. 3: Control and display components

Key

- 1 L2
- 2 N
- 3 ModBus RTU – looped-through (see section 5)
- 4 similar to item 3
- 5 CAN bus (CMC III PU) – looped-through (see section 4.7)
- 6 similar to item 5
- 7 Mini-USB-OTG (see section 4.5)
- 8 LED display (see section 4.3.3)

4.3.2 Activating the NH measurement module

The NH measurement module switches the power supply on automatically. The power can be supplied in two ways that are not mutually exclusive:

1. Self-supply via the phases L1–L2
2. Supply from the CMC III Processing Unit via the CAN bus



Note:

Power supply via ModBus is **not** possible.

The power can be supplied via the CAN bus. 24 VDC is present at pins 3 and 6, GND is present at pins 4 and 5. Whereby, it suffices to assign pins 3 and 4. The

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power supply unit for ModBus and the display with provided adaptor cable offers a plug-and-play solution.



Note:

The measurement electronics of the NH measurement module requires phases L1 and L2. Please observe, in particular, the automated sequences.

4.3.3 LED displays

The NH measurement module uses two LEDs for the status display. The communications and operating states are signalled.

In the normal state, CAN bus (LED 1) and ModBus communication (LED 2) is displayed with the LEDs.

Status	LED 1	LED 2
Communication	Green	Green
Communications error	Red	Red

Tab. 2: LED status displays for the communication

The LEDs for fault messages are used for warnings, alarms, temperature and limit value violations (for the NH measurement module).

Status	LED 1	LED 2
General warning/alarm	Both LEDs flash synchronously red and orange intermittently (1 second)	

Tab. 3: LED status displays for the communication

For USB communication, the LEDs are used for the associated status messages.

Status	Description	LED 1	LED 2
Connected	Connection established, no activity	Orange	Green
Read	The master is reading data	Orange flashing (1/s)	Green
Write	The master is writing data	Orange flashing (1/s)	Red

Tab. 4: Status messages for USB communication

Faults in the USB communication are displayed as follows.

Status	Description	LED 1	LED 2
Fault	Connection fault (defective USB stick, etc.)	Orange	Red flashing (1/s)
Not connected, data validation	Search for valid files (.CNF/.IMG)	Orange	Orange
Not connected, data processing	Data is displaced	Orange	Orange flashing (1/s)
Not connected, file error	Configuration: defective file, incorrect parameters	Both LEDs flash orange for 10 seconds.	

Tab. 5: Status messages for faults in the USB communication

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4.3.4 De-energising

The electronics of the NH measurement module can be de-energised, for example, for any high-voltage inspections.

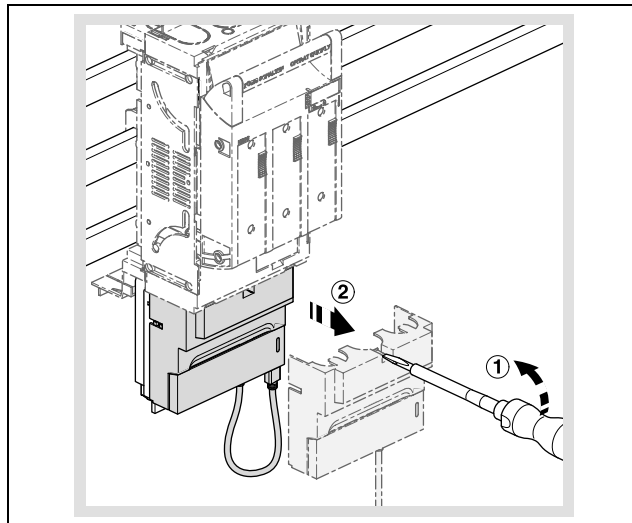
- Ensure that the plant is switched off.



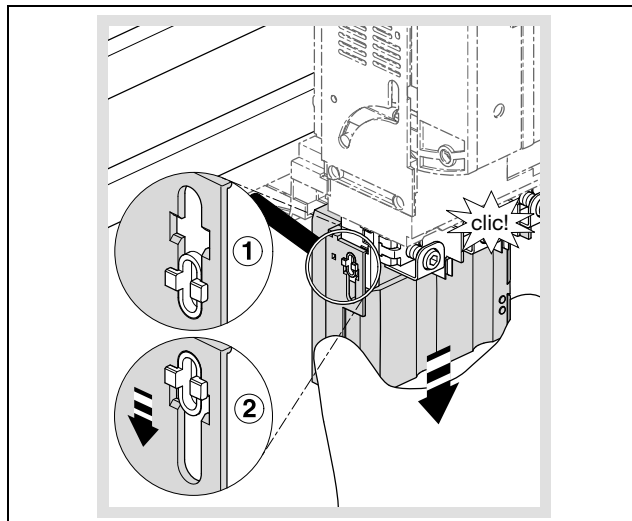
Warning!

If the NH measurement module is connected, the electronics can be loaded to maximum 4 kV. The de-energisation described in the following steps permits a maximum loading of 6 kV.

- Remove the cover.

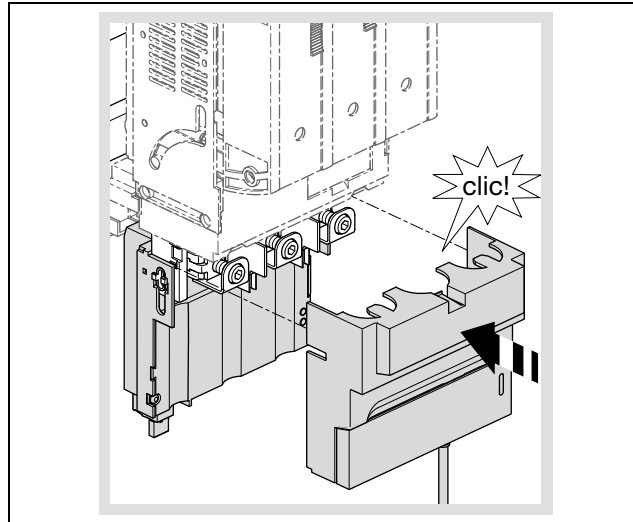


- Pull the lower part of the NH measurement module with the communications connections downwards.



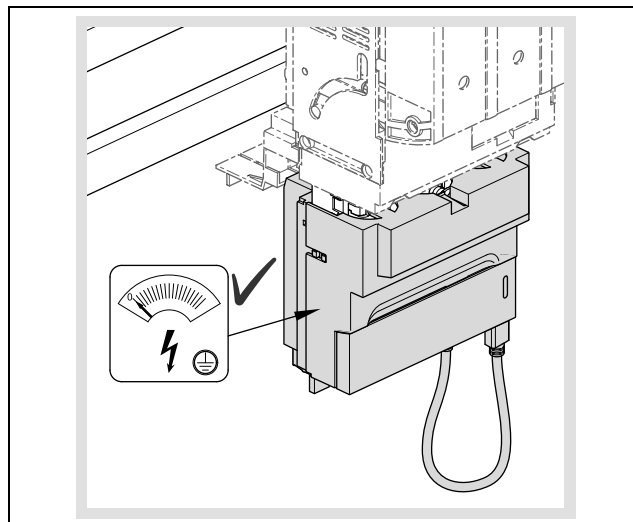
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- Re-assemble the contact hazard protection cover.

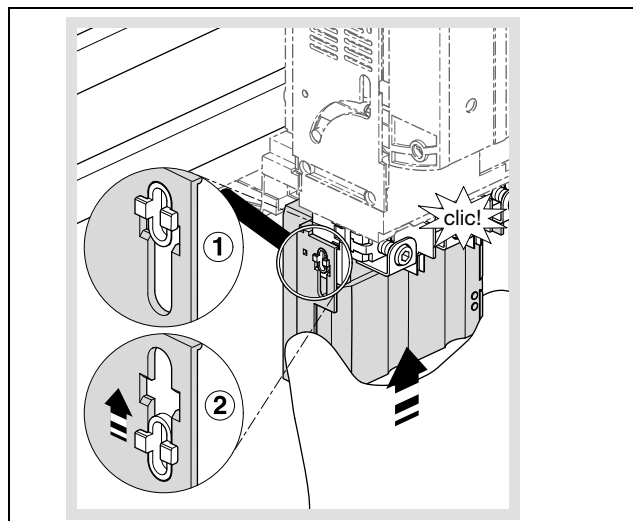


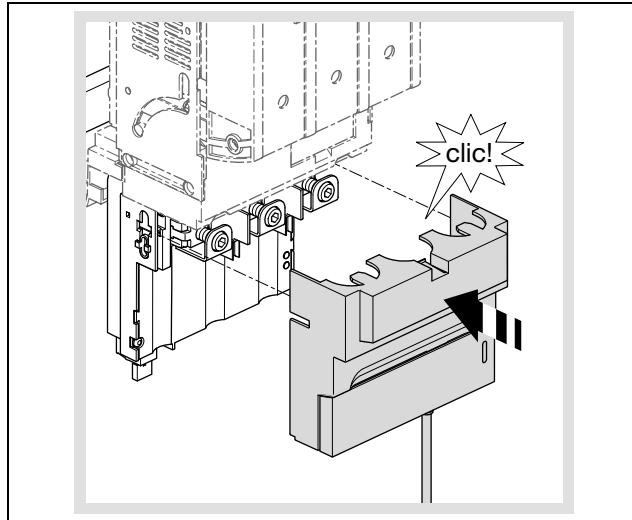
- Ensure that the other end of the USB adaptor present in the cover is connected to the NH measurement module.

The electronics are now de-energised and the NH measurement module can be loaded with maximum 6 kV.



- Proceed in the reverse order to reconnect the measurement electronics.





4.4 Configuration files

4.4.1 General information

The basic configuration of the NH measurement module is performed as standard via the USB interface. This is not allowed when you use the NH measurement module with a CMC III PU. Configuring via ModBus is also possible.

The configuration is made with three different configuration files as described below.

The files generated by the unit at the first start or after deletion by the user have the following file names:

- Alarm configuration: ALARM.CNF
- Logging configuration: LOGGING.CNF
- System configuration: SYSTEM.CNF

In addition to these file names, the following file names are also supported:

- ALA*.CNF or ALA*.cnf
- LOG*.CNF or LOG*.cnf
- SYS*.CNF or SYS*.cnf

This permits the free assignment of maximum five characters, for example, for versions or for differentiation of the configuration for the various NH measurement modules.

The file for **alarm configurations** contains the values for alarms and warnings. This configuration is limited to seven different groups of alarms/warnings directly associated with the measured values.

The logging interval and the list of the values to be logged are specified by the **logging configuration**. The values are stored in the non-volatile data memory of the NH measurement module. If no (valid) logging configuration file is found, the logging starts with the default logging setting.

The **system configuration** contains the basic configuration of the NH measurement module, such as bus addresses.

A comment can be added to the configuration files with the commentary operator "//".

A line break must follow the last parameter to be interpreted; this means that the last line is empty.

4.4.2 File structure



Note:

The time of day for the USB logging can be set via ModBus or the display available as accessory.

The NH measurement module is equipped with a local FAT16 file system on flash memory. This memory is used to save the configuration, log and firmware update files. The file names are limited to 8.3, this means:

- The file name may contain maximum 8 alphanumeric characters (uppercase and lowercase alphabetic characters and numbers).
- A full stop and the extension with exactly 3 characters then follows.

The flash memory is divided into two partitions with the following file structure:

SYSTEM:

```
: \SYSTEM\CONFIG
  ALA*****.cnf
  LOG*****.cnf
  SYS*****.cnf
: \SYSTEM\UPDATE
  FWSL****.img
```

DATA:

```
: \DATA\DATA
  L*****.csv
: \DATA\ALARMS
  A*****.csv
: \DATA\SYSTEM
  S*****.csv
```

The "CONFIG" folder contains the configuration files of the NH measurement module. All configuration files can be identified with their extension *.CNF (or *.cnf).

The NH measurement module generates these files with the current settings in ANSI format. Format UTF-8 is also supported for a configuration.

4.4.3 Serial number

A serial number must always be specified for the configuration files. This number can be found on the type plate (see section 3.5 "Serial number") or in the configuration files generated by the measurement block. All configuration files must contain a line in the following format:

- SERIAL;XxXxXxXxXx (10-digit numeric serial number)

If this line is missing, the configuration file will not be accepted by the NH measurement module.



Note:

It is possible to enter 0000000000 (10x "zeroes") as placeholder in each configuration file. This configuration file will be accepted by **every** NH measurement module. Use this function with care!

4.4.4 Alarm.cnf

```
...
// Symbols:
// AL: alarm low, AH: alarm high
// WL: warning low, WH: warning high
// HY: hysteresis
// U: phase-phase voltage
// VN: phase-neutral voltage+
// I(N): current (neutral)
// P/Q/S: active/reactive/apparent power
UAL;0
UAH;45000
UWL;0
```

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UWH ; 45000
 UHY ; 10
 . . .

All values must be entered with factor 100 or with exactly 2 decimal places, but without decimal point. The hysteresis specified as percentage value ("%") is an exception.

Example:

The NH measurement module should issue a warning for a voltage violation of 410.32 volts. This is achieved with the following input: "UWH;41032".

The following table describes all configuration parameters. In this case, depending on the NH measurement module variant, the nominal current I_{nom} is 150 A, 250 A, 400 A or 600 A.

Name	Description	Min	Max
UAL	Phase-phase voltage alarm LOW	0	45000
UAH	Phase-phase voltage alarm HIGH	0	45000
UWL	Phase-phase voltage warning LOW	0	45000
UWH	Phase-phase voltage warning HIGH	0	45000
UHY	Phase-phase voltage hysteresis	0	100
VNAL	Phase-neutral voltage alarm LOW	0	26000
VNAH	Phase-neutral voltage alarm HIGH	0	26000
VNWL	Phase-neutral voltage warning LOW	0	26000
VNWH	Phase-neutral voltage warning HIGH	0	26000
VNHY	Phase-neutral voltage hysteresis	0	100
IAL	Current alarm LOW	0	$I_{max} = I_{nom} + 20\%$ ¹⁾
IAH	Current alarm HIGH	0	$I_{max} = I_{nom} + 20\%$ ¹⁾
IWL	Current warning LOW	0	$I_{max} = I_{nom} + 20\%$ ¹⁾
IWH	Current warning HIGH	0	$I_{max} = I_{nom} + 20\%$ ¹⁾
IHY	Current hysteresis	0	100
INAL	Current neutral conductor alarm LOW	0	$I_{max} = I_{nom} + 20\%$ ¹⁾
INAH	Current neutral conductor alarm HIGH	0	$I_{max} = I_{nom} + 20\%$ ¹⁾
INWL	Current neutral conductor warning LOW	0	$I_{max} = I_{nom} + 20\%$ ¹⁾
INWH	Current neutral conductor warning HIGH	0	$I_{max} = I_{nom} + 20\%$ ¹⁾
INHY	Current neutral conductor hysteresis	0	100
PAL	Power alarm LOW	$-3 \cdot U_{max} \cdot I_{max}$	$3 \cdot U_{max} \cdot I_{max}$
PAH	Power alarm HIGH	$-3 \cdot U_{max} \cdot I_{max}$	$3 \cdot U_{max} \cdot I_{max}$
PWL	Power warning LOW	$-3 \cdot U_{max} \cdot I_{max}$	$3 \cdot U_{max} \cdot I_{max}$
PWH	Power warning HIGH	$-3 \cdot U_{max} \cdot I_{max}$	$3 \cdot U_{max} \cdot I_{max}$
PHY	Power hysteresis	0	100

Tab. 6: "Alarm configuration" parameter

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Name	Description	Min	Max
QAL	Reactive power alarm LOW	$-3 \cdot U_{\max} \cdot I_{\max}$	$3 \cdot U_{\max} \cdot I_{\max}$
QAH	Reactive power alarm HIGH	$-3 \cdot U_{\max} \cdot I_{\max}$	$3 \cdot U_{\max} \cdot I_{\max}$
QWL	Reactive power warning LOW	$-3 \cdot U_{\max} \cdot I_{\max}$	$3 \cdot U_{\max} \cdot I_{\max}$
QWH	Reactive power warning HIGH	$-3 \cdot U_{\max} \cdot I_{\max}$	$3 \cdot U_{\max} \cdot I_{\max}$
QHY	Reactive power hysteresis	0	100
SAL	Apparent power alarm LOW	$-3 \cdot U_{\max} \cdot I_{\max}$	$3 \cdot U_{\max} \cdot I_{\max}$
SAH	Apparent power alarm HIGH	$-3 \cdot U_{\max} \cdot I_{\max}$	$3 \cdot U_{\max} \cdot I_{\max}$
SWL	Apparent power warning LOW	$-3 \cdot U_{\max} \cdot I_{\max}$	$3 \cdot U_{\max} \cdot I_{\max}$
SWH	Apparent power warning HIGH	$-3 \cdot U_{\max} \cdot I_{\max}$	$3 \cdot U_{\max} \cdot I_{\max}$
SHY	Apparent power hysteresis	0	100

Tab. 6: "Alarm configuration" parameter

4.4.5 Logging.cnf

The logging parameters and the logging interval are defined in the Logging.cnf file.

The logging interval is set to 15 minutes with "INTERVAL;15". The value can be set between 1 and 60, and so represents the associated number of minutes.

The logging parameters set by default are marked with an "x" in the last column of the table below.

Example:

To log the current of phase L1, the line "I1;Y" must be written to the file. The line "I1;N" deactivates the logging for this value.

```
/// logging interval: 1...60 min
INTERVAL;15
// Value, active Y/N
U12;Y
U23;Y
U31;Y
```

Name	Description	
U12	Phase-phase U12 effective voltage	x
U23	Phase-phase U23 effective voltage	x
U31	Phase-phase U31 effective voltage	x
V1N	Phase-neutral V1N effective voltage	
V2N	Phase-neutral V2N effective voltage	
V3N	Phase-neutral V3N effective voltage	
UMAX	U12, U23, U31 maximum voltage	
UMIN	U12, U23, U31 minimum voltage	
UAVG	U12, U23, U31 average voltage	
VMAX	V1N, V2N, V3N maximum voltage	
VMIN	V1N, V2N, V3N minimum voltage	

Tab. 7: Logging configuration parameters

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Name	Description	
VAVG	V1N, V2N, V3N average voltage	
I1	I1 current	x
I2	I2 current	x
I3	I3 current	x
IN	IN current	x
IMAX	Maximum of I1, I2, I3	
IMIN	Minimum of I1, I2, I3	
IAVG	Average of I1, I2, I3	
P1	Phase 1 P1 active power	
P2	Phase 2 P2 active power	
P3	Phase 3 P3 active power	
PMAX	Maximum of P1, P2, P3	
PMIN	Minimum of P1, P2, P3	
PT	Total active power	x
Q1	Phase 1 Q1 reactive power	
Q2	Phase 2 Q2 reactive power	
Q3	Phase 3 Q3 reactive power	
QMAX	Maximum of Q1, Q2, Q3	
QMIN	Minimum of Q1, Q2, Q3	
QT	Total reactive power	x
S1	Phase 1 S1 apparent power	
S2	Phase 2 S2 apparent power	
S3	Phase 3 S3 apparent power	
SMAX	Maximum of S1, S2, S3	
SMIN	Minimum of S1, S2, S3	
ST	Total apparent power	x
PF1	Phase 1 PF1 power factor	x
PF2	Phase 2 PF2 power factor	x
PF3	Phase 3 PF3 power factor	x
PFT	Total power factor	
FREQ	F mains frequency	x
THDFU12	THDf of U12	
THDFU23	THDf of U23	
THDFU31	THDf of U31	
THDFI1	THDf of I1	

Tab. 7: Logging configuration parameters

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Name	Description	
THDFI2	THDf of I2	
THDFI3	THDf of I3	
EA	Total active energy	
EARUN	Run time active energy	
EAC	Total adaptable active energy	
EACRUN	Run time adaptable active energy	
ER	Total reactive energy	
EAIN	Direct active energy	
EAOUT	Reverse active energy	
ES	Apparent energy	

Tab. 7: Logging configuration parameters

4.4.6 System.cnf

The base system configuration of the NH measurement module is made in the System.cnf file with the following commands:

Command	Valid values	Description
MODADR;	1-247	ModBus RTU address
MODBAU;	9600 19200 38400 8E1	ModBus baud rate
TOPOL;	1 2 3 4	1 = 3-conductor operation (L1+L2+L3), bottom connection – Insert jumper! 2 = 4-conductor operation (L1+L2+L3+N), bottom connection – Connect N! 3 = 3-conductor operation (L1+L2+L3), top connection (only size NH00) – Insert jumper! 4 = 4-conductor operation (L1+L2+L3+N), top connection (only size NH00) – Connect N!
LEDCFG;	0 1	0 = LEDs On 1 = LEDs Off

Tab. 8: System configuration parameters

```
//
// System configuration
//
// Serial number (max. 10 characters)
SERIAL;1501700000
// ModBus address: 1...247
MODADR;247
// ModBus baud rate: 9600 / 19200 /
// 38400, 8E1
MODBAU;19200
// Topology:
// 1/2: 3-/4-wire bottom mounting
```

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```
// 3/4: 3-/4-wire top mounting
TOPOL;2
// LED configuration: 0 = CAN LEDs on /
// 1 = CAN LEDs off
LEDCFG;0
```

4.5 Access via USB

4.5.1 Connection



Note:

Ensure that the NH measurement module is operational so that the USB functionality can be used (see section 4.3.2 "Activating the NH measurement module").



Note:

Ensure that the other end of the USB adaptor present in the cover is connected to the NH measurement module.



Note:

Logging is not possible for active USB connection.



Additional safety instruction:

No USB connection may be established when using CAN bus!

The NH measurement module uses the USB standard "USB-OTG". This permits operation in USB slave mode and USB master mode. To allow easy access, the USB connection is mounted in the front cover of the NH measurement module.

- Open the cover in order to insert a USB stick with USB-OTG adaptor or to establish a connection via a micro USB cable to a PC.



Fig. 4: Front cover of the NH measurement module

4.5.2 Access via computer

To connect the NH measurement module to a computer, you require a commercially available micro USB cable.

- Connect the USB cable with the NH measurement module and your computer. After a short time, two removable storage media are displayed (see section 4.4.2 "File structure"), the LEDs of the NH measurement module light green and orange (see section 4.3.3 "LED displays").
 - The **SYSTEM** removable storage media is used for configuring the NH measurement module.
 - The **DATA** removable storage media contains the stored (logged) values and alarms of the NH measurement module.

4.5.3 Access via USB stick



Note:

USB access via computer requires one of the following operating systems: Windows 7 or later or Mac OS X 10.6 or later.

To connect a USB stick to the NH measurement module, you require a commercially available USB-OTG adaptor. This is the same adaptor used with smartphones to connect USB sticks. The adaptor consists of a micro USB connector and a USB A socket.



Note:

The deployed USB stick must be FAT16, FAT32 or exFAT formatted and may have a maximum power consumption of 100 mA. External hard disks are not supported.



Additional safety instruction:

No USB connection may be established when using CAN bus!

When connecting a USB stick, the NH measurement module proceeds as follows:

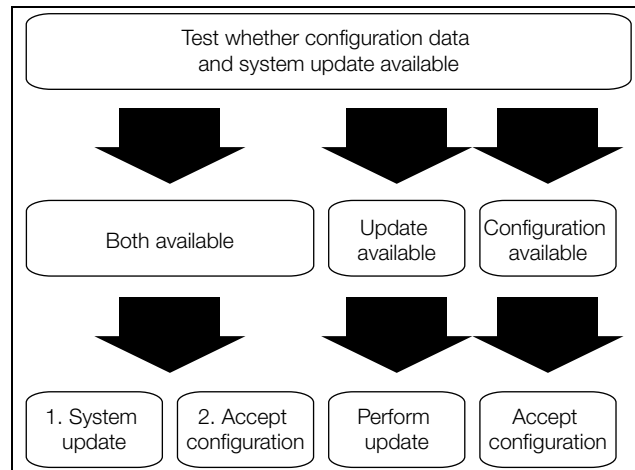


Fig. 5: USB stick connection to the NH measurement module

4.6 Firmware update

4.6.1 General information



Note:

When the NH measurement module is operated with a CMC III PU, the firmware is updated automatically via the CMC III PU.



Additional safety instruction:

A simultaneous use of CAN bus and USB interface is not allowed!

The firmware can be updated via the USB interface (see section 4.5 "Access via USB"), whereby a firmware file (.img) is required. This file can be downloaded from the Rittal home page. The actual update is made via the computer (see section 4.6.2 "Firmware update via a personal computer") or via a USB stick (see section 4.6.3 "Firmware update via a USB stick").

4.6.2 Firmware update via a personal computer

- Copy the firmware file (.img) to the UPDATE folder on the SYSTEM removable storage medium in order to update the firmware via computer (see section 4.5.2 "Access via computer").

LED 1 and LED 2 light orange and red, respectively, during the copy action.

- Wait until the copy action has completed, and LED 1 and LED 2 light orange and green, respectively.
- Finally, separate the USB connection and wait until the NH measurement module has restarted.

After a successful update, the LEDs indicate the bus status or warnings/alarms again.

4.6.3 Firmware update via a USB stick

- Copy the firmware file (.img) to the Root directory of the USB stick (the main level, not in a folder) in order to update the firmware via a USB stick.
- Insert the USB stick in the NH measurement module.

LED 1 and LED 2 light orange and green, respectively, during the copy action.

- Wait until the copy action has completed, and LED 1 and LED 2 light orange and green, respectively.
- Separate the connection.

After a successful update, the LEDs indicate the bus status or warnings/alarms again.

4.7 CMC III (CAN bus)

4.7.1 Connection to a CMC III Processing Unit



Note:

Ensure that the current firmware version of the CMC III PU is installed. A current version is available from the Rittal home page.



Note:

A maximum of ten NH measurement modules (five per CAN bus connection) may be connected to the CMC III PU (7030.000); a maximum of four NH measurement modules may be connected to the CMC III PU Compact (7030.010).

- Connect the NH measurement module via a CAN bus connection cable (RJ 45) with the CMC III PU or the neighbouring elements in the CAN bus.
- Assemble the provided ferrite to the connection cable between the CMC III PU and the NH measurement module as shown.

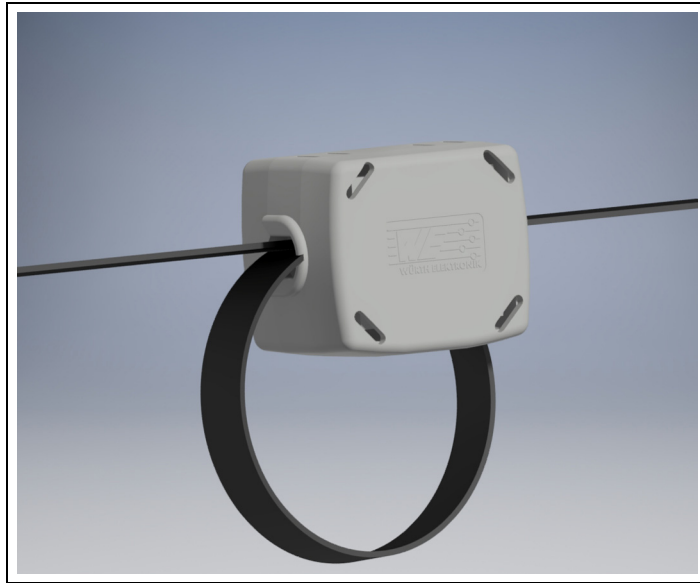


Fig. 6: Assembly of the ferrite to the connection cable

The connection is made as daisy chain; the connection is looped-through. The NH measurement module is supplied with the necessary operating voltage via the CAN bus connection.



Note:

Connection cables with various lengths can be purchased from Rittal.

The following CAN bus connection cables from the CMC III accessories range may be used:

- 7030.090 (length 0.5 m)
- 7030.091 (length 1 m)
- 7030.092 (length 1.5 m)
- 7030.093 (length 2 m)
- 7030.480 (length 3 m)
- 7030.490 (length 4 m)
- 7030.094 (length 5 m)
- 7030.095 (length 10 m)

The NH measurement module software is updated, if necessary, after connection.

During the complete update action, the status LED of the CMC III Processing Unit flashes white and a corresponding message appears on the home page.



Note:

No settings can be made as long as the update process is running.

- Press the "C" key on the CMC III PU (an initial audio signal will sound), and keep it pressed for approx. 3 seconds until a second audio signal is heard. If the installation was unsuccessful, see section 1.5 "Associated documents".

4.7.2 Operating via the CMC III Processing Unit home page

After the login to the CMC III PU, the web user interface for operating the unit is displayed.

- First select the "CMCIII-SES" entry in the navigation area.

On the **Settings** tab, similar to the CMC III PU, the access rights for the NH measurement module (**Settings for unit access rights** button) as well as the alarm notification are specified individually (**Settings for all alarms** button).

All settings for the NH measurement module are made on the **Monitor** tab. All general settings that affect the NH measurement module are made at the "Real units" level.

5 ModBus

Terms and definitions

Term	Description
NULL	Termination of an ASCII string with "\0"
NH measurement module	Rittal NH measurement module

Tab. 9: Terms and definitions

Abbreviations

Abbreviation	Description
ACS	Access rights (read/write)
DT	Data type
RES	Resolution, number of fractional digits contained within a parameter, i.e. 10^{-1} represents 1 fractional digit
RTU	Remote Terminal Unit

Tab. 10: Abbreviations

The NH measurement module may be used as a ModBus RTU Slave. Both ModBus RTU sockets (RJ 45) are linked. Standard ModBus RTU commands are supported.

The pin assignments of the RJ 45 sockets are as follows:

Pin	Assignment
4	D1 (B)
5	D0 (A)
8	GND

Tab. 11: Pin assignment

5.1 Bus parameters

The ModBus interface of the NH measurement module supports the settings described in table 12.

Parameter	Settings
Device type	Slave (fixed)
Slave address	1...247
Transmission mode	RTU (fixed)
Baud rate	9600 19200 (default) 38400
Parity	Even (fixed)
Data bits	8 (fixed)

Tab. 12: ModBus interface parameters

Parameter	Settings
Stop bits	1 (fixed)

Tab. 12: ModBus interface parameters

The baud rate can be adjusted via the device settings (see section 5.3 "Supported ModBus commands"). The default address of the NH measurement module is 247 (0xF7).

The module can be addressed via broadcast (address 0x00) at any time.



Note:

The slave address and baud rate can be set at any time using USB and the "System.cnf" file (see section 4.4.6 "System.cnf").



Additional safety instruction:

No USB connection may be established when using CAN bus!

5.2 Data types (DT)

5.2.1 Supported data types

DT	Words	Description
u16	1	unsigned short (16-bit unsigned integer)
s32	2	signed long (32-bit signed integer)
ASCII	n/2	n-byte ASCII string, n always equal

Tab. 13: Supported data types

If the number of characters of the ASCII string equals the maximum number of bytes "n", the string does not need to be terminated. If the number of characters is smaller than "n", the remaining bytes are filled up with NULL ("\0").

5.2.2 Byte order

The transmission over ModBus uses a big-endian representation for addresses and data items, which means, if a numerical quantity containing more than a single byte is transmitted, the most significant byte is sent first (example: hours:minutes:seconds).

Table 14 shows the byte representation of the supported data types.

DT	Value	Hex value	+0	+1	+2	+3
s32	305419896	0x12345678	12	34	56	78
u16	4660	0x1234	12	34	–	–

Tab. 14: Byte order of the numerical data types

5.3 Supported ModBus commands

The supported ModBus commands are summarised in 15.

Command	Description
0x03	Read Holding Registers (see sections 5.4 and 5.5)
0x06	Write Single Register (see section 5.4)
0x10	Write Multiple Register (see section 5.4)

Tab. 15: ModBus commands

Command	Description
0x2B	Read Device Identification (see section 5.7)
0x41	Time synchronisation (see section 5.3.3)
0x43	User Blocks (see section 5.8)
0x44	Set slave address (see section 5.3.1).

Tab. 15: ModBus commands

5.3.1 Slave address

A new slave address can be set at any time via the ModBus master. The command to set the slave address of the NH measurement module is broadcast including the new slave address and the unique serial number of the device. The slave address is taken over if the given serial number matches the device's serial number.

The command 0x44 is used for customised addressing of the slave. Data is sent using standard ModBus RTU framing as explained in table 16.

Address	0 (broadcast)
Command	68 (0x44)
New address	1...247
10-byte serial number	See sections 3.5 and 5.7
ModBus CRC	16-bit CRC

Tab. 16: Command for allocation of slave address

The serial number of the device is printed on the rating plate of the NH measurement module (see section 3.5 "Serial number") and it is included in the device identification (see section 5.7 "Device identification").

Because broadcast messages are not answered by the slaves, the master should check the successful re-addressing of the slave via a query, i.e. polling the slave's identification data by using the new slave address.

5.3.2 Baud rate

The baud rate can be adjusted via the device settings of the NH measurement module (see section 5.4 "Device settings").

After a successful write access (positive write response), the ModBus interface is re-started with the new baud rate.



Note:

Starting the ModBus interface with the new baud rate may lead to communication errors.

To re-establish the communication, the ModBus master and the remaining slaves also have to be configured with the new baud rate.

5.3.3 Time synchronisation

Setting the device's time can also be achieved by writing the register 0xD005 of the device settings.

The command described below is sent as broadcast frame.

Address	Command	6-byte data					
		0	1	2	3	4	5
0x00 (broadcast)	0x41	Magic number (0x1664)		Date/time in seconds since 2000			

Tab. 17: Time synchronisation

A constant magic number is systematically inserted into each frame by the master.

The Slave has to validate a magic number within the request. The valid magic number is defined as 0x1664.

5.4 Device settings

The device settings are changed with ModBus command 0x10 (Write Multiple Registers) or 0x06 (Write Single Register).

Reading of the device settings is supported by ModBus command 0x03 (Read Holding Registers).

Address	Words	Description	Min	Max	RES	Unit	DT	ACS
0xD001	1	Status bit-field register: Time status (bit 0): 0 = Not synchronised 1 = Date/time is synchronised Slave restart status (bit 1): 0 = Not (re-)started 1 = (Re-)started Global alarm status (bit 2): 0 = No alarm is present 1 = At least one alarm is present	0	0x0007	1		u16	R
0xD002	1	Baud rate enumeration: 0: 9600 1: 19200 2: 38400	0	2	1		u16	R/W
0xD003	1	Custom settings: Bit 0: Reset Min/Max values Bit 1: Reserved Bit 2...7 = 0; reset all Bit 2 = Current Bit 3 = Voltage Bit 4 = Power Bit 5 = Power factor Bit 6 = THD Bit 7 = Frequency Bit 8...15: Reserved Read access returns the last written bitmask, bit 0 always set to 0	1	2	1		u16	R/W
0xD004	1	Measuring system topology: 1 = 3-wire system, bottom mounting 2 = 4-wire system, bottom mounting (standard) 3 = 3-wire system, top mounting 4 = 4-wire system, top mounting	1	2	1		u16	R/W
0xD005	2	Set UTC date and time: Seconds from 1 January 2000, 00:00 h	0	2147483647	1	S	s32	R/W
0xD007	1	UTC date and time: Add-on in ms	0	999	1	ms	u16	R

Tab. 18: Device settings

5 ModBus

EN

Address	Words	Description	Min	Max	RES	Unit	DT	ACS
0xD008	1	UTC date and time: 1: time set 0: time not set	0	1	1		u16	R
0xD009	2	Timestamp machine, seconds from the first start-up machine	0	2147483647	1	S	s32	R
0xD00B	1	Timestamp machine: Add-on in ms		999	1	ms	u16	R
0xD00C	2	Operating hours meter: Seconds from last start-up	0	2147483647	1	S	s32	R
0xD00E	1	Number of start-up: Increment with every power-up/reset	0	65535	1		u16	R
0xD00F	1	Configuration counter: Incremented with every configuration	0	65535	1		u16	R
0xD010	2	Phase-phase voltage: Alarm threshold low	0	45000	10 ⁻²	V	s32	R/W
0xD012	2	Phase-phase voltage: Alarm threshold high	0	45000	10 ⁻²	V	s32	R/W
0xD014	2	Phase-phase voltage: Warning threshold low	0	45000	10 ⁻²	V	s32	R/W
0xD016	2	Phase-phase voltage: Warning threshold high	0	45000	10 ⁻²	V	s32	R/W
0xD018	2	Phase-phase voltage: Hysteresis	0	1000	10 ⁻¹	%	s32	R/W
0xD01A	2	Phase-neutral voltage: Alarm threshold low	0	26000	10 ⁻²	V	s32	R/W
0xD01C	2	Phase-neutral voltage: Alarm threshold high	0	26000	10 ⁻²	V	s32	R/W
0xD01E	2	Phase-neutral voltage: Warning threshold low	0	26000	10 ⁻²	V	s32	R/W
0xD020	2	Phase-neutral voltage: Warning threshold high	0	26000	10 ⁻²	V	s32	R/W
0xD022	2	Phase-neutral voltage: Hysteresis	0	1000	10 ⁻¹	%	s32	R/W
0xD024	2	Current: Alarm threshold low	0	1)	10 ⁻¹	A	s32	R/W
0xD026	2	Current: Alarm threshold high	0	1)	10 ⁻¹	A	s32	R/W
0xD028	2	Current: Warning threshold low	0	1)	10 ⁻¹	A	s32	R/W
0xD02A	2	Current: Warning threshold high	0	1)	10 ⁻¹	A	s32	R/W
0xD02C	2	Current: Hysteresis	0	1000	10 ⁻¹	%	s32	R/W
0xD02E	2	Current neutral: Alarm threshold low	0	1)	10 ⁻¹	A	s32	R/W
0xD030	2	Current neutral: Alarm threshold high	0	1)	10 ⁻¹	A	s32	R/W
0xD032	2	Current neutral: Warning threshold low	0	1)	10 ⁻¹	A	s32	R/W

Tab. 18: Device settings

Address	Words	Description	Min	Max	RES	Unit	DT	ACS
0xD034	2	Current neutral: Warning threshold high	0	1)	10^{-1}	A	s32	R/W
0xD036	2	Current neutral: Hysteresis	0	1000	10^{-1}	%	s32	R/W
0xD038	2	Total active power: Alarm threshold low	2)	2)	10^{-2}	kW	s32	R/W
0xD03A	2	Total active power: Alarm threshold high	2)	2)	10^{-2}	kW	s32	R/W
0xD03C	2	Total active power: Warning threshold low	2)	2)	10^{-2}	kW	s32	R/W
0xD03E	2	Total active power: Warning threshold high	2)	2)	10^{-2}	kW	s32	R/W
0xD040	2	Total active power: Hysteresis	0	1000	10^{-1}	%	s32	R/W
0xD042	2	Total reactive power: Alarm threshold low	0	2)	10^{-2}	kW	s32	R/W
0xD044	2	Total reactive power: Alarm threshold high	0	2)	10^{-2}	kW	s32	R/W
0xD046	2	Total reactive power: Warning threshold low	0	2)	10^{-2}	kW	s32	R/W
0xD048	2	Total reactive power: Warning threshold high	0	2)	10^{-2}	kW	s32	R/W
0xD04A	2	Total reactive power: Hysteresis	0	1000	10^{-1}	%	s32	R/W
0xD04C	2	Total apparent power: Alarm threshold low	2)	2)	10^{-2}	kW	s32	R/W
0xD04E	2	Total apparent power: Alarm threshold high	2)	2)	10^{-2}	kW	s32	R/W
0xD050	2	Total apparent power: Warning threshold low	2)	2)	10^{-2}	kW	s32	R/W
0xD052	2	Total apparent power: Warning threshold high	2)	2)	10^{-2}	kW	s32	R/W
0xD054	2	Total apparent power: Hysteresis	0	1000	10^{-1}	%	s32	R/W
0xD056	20	Custom field 1	3)	3)			ASCII	R/W
0xD06A	20	Custom field 2	3)	3)			ASCII	R/W

Tab. 18: Device settings

1) $I_{MAX} = I_N + 20\%$, I_N : Rated current.

The nominal current ranges from 150 A, 250 A, 400 A to 600 A and is available to ModBus via "Device Identification", parameter "Nominal rating".

$$I_{MAX} = 600 \text{ A} + 20\% = 720 \text{ A}$$

$$\text{Max} = I_{MAX} / \text{RES} = 7200$$

2) $P_{MAX} = Q_{MAX} = S_{MAX} = U_{MAX} \cdot I_{MAX}$, $U_{MAX} = 450 \text{ V}$

$$I_{MAX} = 720 \text{ A} \Rightarrow P_{MAX} = 324 \text{ kW}$$

$$\text{Min} = -P_{MAX} / \text{RES} = -32400$$

$$\text{Max} = P_{MAX} / \text{RES} = 32400$$

$$\Rightarrow Q_{totMAX} = 3 \cdot Q_{MAX} = 972 \text{ kW}$$

$$\text{Min} = -Q_{totMAX} / \text{RES} = -97200$$

$$\text{Max} = \text{Qtot}_{\text{MAX}} / \text{RES} = 97200$$

3) The custom fields 1 and 2 are user configurable ASCII strings containing a maximum of 40 characters including NULL termination.

By default the custom fields 1/2 contains the string "Custom field 1/2".

Write access to one of the custom fields must always consist of 40 bytes, unused bytes must be set to 0.

5.5 Data register

The data registers described in table 19 are read by command 0x03 (Read Holding Registers).

All registers described in table 19 are read only.

ADDR	Words	Description	Min	Max	RES	Unit	DT
0x0002	2	RMS phase-phase voltage U12	0	45000	10 ⁻²	V	s32
0x0004	2	RMS phase-phase voltage U23	0	45000	10 ⁻²	V	s32
0x0006	2	RMS phase-phase voltage U31	0	45000	10 ⁻²	V	s32
0x0008	2	RMS phase-neutral voltage V1N	0	26000	10 ⁻²	V	s32
0x000A	2	RMS phase-neutral voltage V2N	0	26000	10 ⁻²	V	s32
0x000C	2	RMS phase-neutral voltage V3N	0	26000	10 ⁻²	V	s32
0x000E	2	RMS current on phase 1: I1	0	1)	10 ⁻¹	A	s32
0x0010	2	RMS current on phase 2: I2	0	1)	10 ⁻¹	A	s32
0x0012	2	RMS current on phase 3: I3	0	1)	10 ⁻¹	A	s32
0x0014	2	RMS current on neutral: IN	0	1)	10 ⁻¹	A	s32
0x0016	2	Active power on phase 1 P1	0	2)	10 ⁻²	kW	s32
0x0018	2	Active power on phase 2 P2	0	2)	10 ⁻²	kW	s32
0x001A	2	Active power on phase 3 P3	0	2)	10 ⁻²	kW	s32
0x001C	2	Total active power Ptot	0	3)	10 ⁻²	kW	s32
0x001E	2	Reactive power on phase 1 Q1	2)	2)	10 ⁻²	kvar	s32
0x0020	2	Reactive power on phase 2 Q2	2)	2)	10 ⁻²	kvar	s32
0x0022	2	Reactive power on phase 3 Q3	2)	2)	10 ⁻²	kvar	s32
0x0024	2	Total reactive power Qtot	3)	3)	10 ⁻²	kvar	s32
0x0026	2	Apparent power on phase 1 S1	0	2)	10 ⁻²	kVA	s32
0x0028	2	Apparent power on phase 2 S2	0	2)	10 ⁻²	kVA	s32
0x002A	2	Apparent power on phase 3 S3	0	2)	10 ⁻²	kVA	s32
0x002C	2	Total apparent power Stot	0	3)	10 ⁻²	kVA	s32
0x002E	2	Maximum voltage U12, U23, U31	0	45000	10 ⁻²	V	s32
0x0030	2	Maximum voltage V1N, V2N, V3N	0	26000	10 ⁻²	V	s32
0x0032	2	Maximum current I1, I2, I3	0	1)	10 ⁻¹	A	s32
0x0034	2	Maximum active power P1, P2, P3	0	2)	10 ⁻²	kW	s32
0x0036	2	Maximum reactive power Q1, Q2, Q3	2)	2)	10 ⁻²	kvar	s32

Tab. 19: Data register

ADDR	Words	Description	Min	Max	RES	Unit	DT
0x0038	2	Maximum apparent power S1, S2, S3	0	2)	10 ⁻²	kVA	s32
0x003A	2	Minimum voltage U12, U23, U31	0	45000	10 ⁻²	V	s32
0x003C	2	Minimum voltage V1N, V2N, V3N	0	26000	10 ⁻²	V	s32
0x003E	2	Minimum current I1, I2, I3	0	1)	10 ⁻¹	A	s32
0x0040	2	Minimum active power P1, P2, P3	0	2)	10 ⁻²	kW	s32
0x0042	2	Minimum reactive power Q1, Q2, Q3	2)	2)	10 ⁻²	kvar	s32
0x0044	2	Minimum apparent power S1, S2, S3	0	2)	10 ⁻²	kVA	s32
0x0046	2	Arithmetic average of U12, U23 and U31	0	45000	10 ⁻²	V	s32
0x0048	2	Arithmetic average of V1N, V2N and V3N	0	26000	10 ⁻²	V	s32
0x004A	2	Arithmetic average of I1, I2 and I3	0	1)	10 ⁻¹	A	s32
0x004C ... 0x004F		Reserved					
0x0050	2	Power factor on phase 1 PF1 (cos ?)	-100	100	10 ⁻²		s32
0x0052	2	Power factor on phase 2 PF2 (cos ?)	-100	100	10 ⁻²		s32
0x0054	2	Power factor on phase 3 PF3 (cos ?)	-100	100	10 ⁻²		s32
0x0056	2	Total power factor PFTOT	-100	100	10 ⁻²		s32
0x0058	2	Network frequency F	0	650	10 ⁻¹	Hz	s32
0x005A	2	THDf of U12	0	1000	10 ⁻¹	%	s32
0x005C	2	THDf of U23	0	1000	10 ⁻¹	%	s32
0x005E	2	THDf of U31	0	1000	10 ⁻¹	%	s32
0x0060	2	THDf of V1N	0	1000	10 ⁻¹	%	s32
0x0062	2	THDf of V2N	0	1000	10 ⁻¹	%	s32
0x0064	2	THDf of V3N	0	1000	10 ⁻¹	%	s32
0x0066	2	THDf of I1	0	1000	10 ⁻¹	%	s32
0x0068	2	THDf of I2	0	1000	10 ⁻¹	%	s32
0x006A	2	THDf of I3	0	1000	10 ⁻¹	%	s32
0x006C	2	Absolute active energy Ea	0	2147483647	10 ⁻¹	kWh	s32
0x006E	2	Absolute reactive energy Er	0	2147483647	10 ⁻¹	kvarh	s32
0x0070	2	Absolute apparent energy Es	0	2147483647	10 ⁻¹	kVAh	s32
0x0072	2	Direct active energy EaIN	0	2147483647	10 ⁻¹	kWh	s32
0x0074	2	Reverse active energy EaOUT	0	2147483647	10 ⁻¹	kWh	s32
0x0076	2	Absolute active energy Ea custom	0	2147483647	10 ⁻¹	kWh	s32
0x0078	2	Absolute active energy runtime	0	2147483647	1	S	s32
0x007A	2	Absolute active energy custom runtime	0	2147483647	1	S	s32
0x007C	2	Temperature	0	2147483647	10 ⁻¹	°C	s32

Tab. 19: Data register

5 ModBus

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ADDR	Words	Description	Min	Max	RES	Unit	DT
0x007E	1	Error register 4)	0	0xFF	1		u16
0x007F		Reserved					
0x0080	1	RMS phase-phase voltage state	5)	5)	1		u16
0x0081	1	RMS phase-neutral voltage state	5)	5)	1		u16
0x0082	1	RMS current on phase state	5)	5)	1		u16
0x0083	1	RMS current on neutral state	5)	5)	1		u16
0x0084	1	Active power state	5)	5)	1		u16
0x0085	1	Reactive power state	5)	5)	1		u16
0x0086	1	Apparent power state	5)	5)	1		u16
0x0087	1	Temperature state	6)	6)	1		u16
0x0088... 0x008F		Reserved					

Tab. 19: Data register

1) $I_{MAX} = I_N + 20\%$, I_N : Rated current.

The nominal current ranges from 150 A, 250 A, 400 A to 600 A and is available to ModBus via "Device Identification", parameter "Nominal rating".

$$I_{MAX} = 600A + 20\% = 720A$$

$$Max = I_{MAX} / RES = 7200$$

2) $P_{MAX} = Q_{MAX} = S_{MAX} = U_{MAX} \cdot I_{MAX}$, $U_{MAX} = 450 V$

$$I_{MAX} = 720 A \Rightarrow P_{MAX} = 324 kW$$

$$Min = -P_{MAX} / RES = -32400$$

$$Max = P_{MAX} / RES = 32400$$

3) $Q_{totMAX} = 3 \cdot Q_{MAX} = 972 kW$

$$Min = -Q_{totMAX} / RES = -97200$$

$$Max = Q_{totMAX} / RES = 97200$$

4) The error register is a field of 8 bits. The contained bits refer to the CMC III error register. Each bit stands for a certain error type. The following errors are supported:

- Bit 0: generic error (system error)
- Bit 3: temperature (device temperature too high)

5) The general state of a parameter may contain the following values:

- 1: Not available, i.e. current neutral in a 3-phase network
- 4: Value OK
- 6: Warning, value too high
- 7: Alarm, value too low
- 8: Alarm, value too high
- 9: Warning, value too low

6) The temperature state uses the same values as in 5), but only supports the states:

- 4: Value OK
- 8: Alarm, value too high

5.6 Alarm configuration

The generation of alarms and warnings is available for the process values described in table 20.

Voltage and current alarms are generated from the minimum and maximum value, alarms for power related values are generated from the total value of the three phases.

Value	Reference low	Reference high
Phase-phase voltage (U12, U23, U31)	Min (U12, U23, U31)	Max (U12, U23, U31)
Phase-neutral voltage (V1N, V2N, V3N)	Min (V1N, V2N, V3N)	Max (V1N, V2N, V3N)
Current on phase (I1, I2, I3)	Min (I1, I2, I3)	Max (I1, I2, I3)
Current on neutral (IN)	IN	IN
Active power (P1, P2, P3)	$P_{tot} = P1+P2+P3$	$P_{tot} = P1+P2+P3$
Reactive power (Q1, Q2, Q3)	$Q_{tot} = Q1+Q2+Q3$	$Q_{tot} = Q1+Q2+Q3$
Apparent power (S1, S2, S3)	$S_{tot} = S1+S2+S3$	$S_{tot} = S1+S2+S3$

Tab. 20: Alarm/warning values and reference values

If an alarm or warning is pending, the general state of the values (data register 0x0080...0x0086) is set to the corresponding state:

- 6: Warning, value too high
- 7: Alarm, value too low
- 8: Alarm, value too high
- 9: Warning, value too low

5.6.1 Configuration values

The configuration is located in the device settings (register 0xD010...0xD054) and provides 5 registers for every value: warning threshold LOW/HIGH, alarm threshold LOW/HIGH and hysteresis.

Lower limit:

The alarm or warning is pending (state = 7/9), if the value falls below the lower threshold and is set to idle (state 4 = OK), if the value is higher than the lower threshold + hysteresis.

Upper limit:

The alarm or warning is pending (state = 6/8), if the value exceeds the upper threshold and is set to idle (state 4 = OK), if the value falls below the upper threshold - hysteresis.

The hysteresis value in % always corresponds to the configured maximum value of the alarm and/or warning threshold.

5.6.2 Example

- Voltage phase neutral, Min = 195 V
- Warning threshold LOW: 200 V
- Hysteresis 10%

The lower warning is pending: value < 200 V (state = 9).

Condition to reset the warning to idle (state = 4): value > 220 V

To disable an alarm/warning, the corresponding values merely have to be set to the maximum and minimum configurable values (see limits and additional notes in table 19).

There is no separate activation/deactivation configuration for the alarms/warnings available.

To use alarm and warning functionality without the hysteresis, the corresponding values are simply configured to 0%.

5.7 Device identification

The NH measurement module supports the extended device identification objects described in table 21 in accordance with the ModBus protocol.

The specific objects are transferred with the real length of the ASCII string.

The supported access types are:

- 01: basic device identification (stream access)
- 02: regular device identification (stream access)
- 03: extended device identification (stream access)

The object values defined in table 21 are examples only (or default values), the contents of these objects can be modified at the production site.

Object ID	Object name	Type	Object value
0x02	Version number (product)	ASCII	1.0.0
0x03	Vendor URL	ASCII	www.rittal.com
0x04	Product name (brand name)	ASCII	Rittal
0x05	Model name (range name)	ASCII	NH measurement module
0x80	Product code (serial number)	ASCII	10 digits (see section 3.5)
0x82	Production date (week and year)	ASCII	WWYY
0x83	Software version	ASCII	V01.00
0x84	Hardware version	ASCII	V01.00
0x86	Power consumption	ASCII	150/250/400/600

Tab. 21: Device identification

5.8 User blocks

The user block function (0x43) is used to access variable sets of device settings and/or data registers in one request, which do not have consecutive register addresses. The user block command supports the sub-commands 0x01 (setup user block), 0x02 (read user block) and 0x03 (write user block).

Up to 8 user blocks are supported, which have to be defined by the specific set-up request. Any read or write access to a user block, which has not been setup before, will return an error.

If the measurement module or the ModBus interface is re-started – for example due to modified settings – the defined user blocks have to be set up again.



Note:

After changing the baud rate or the slave address, the ModBus interface is re-started.

A user block request starts with a command request header, which is described in the table below:

Byte	Data	Description
0	0x43	Command "User Block"
1	0x16	Magic number (MSB)
2	0x64	Magic number (LSB)

Tab. 22: Command request header

Byte	Data	Description
3	0x01...0x03	Sub-command: 0x01 = Setup 0x02 = Read 0x03 = Write
4	0x01...0x08	User block ID (1...8)
5	0x01...0x78	Number of variables (1...120)

Tab. 22: Command request header

A successful response starts with a response header, which is described in the table below:

Byte	Data	Description
0	0x43	Command "User Block"
1	0x01...0x03	Sub-command: 0x01 = Setup 0x02 = Read 0x03 = Write
2	0x01...0x08	User block ID (1...8)
3	0x01...0x78	Number of variables (1...120)

Tab. 23: Response header

If an error occurs, the slave responds with one of the ModBus error codes in the following pattern: byte 0: 0x43 + 0x80 and one of the codes in byte 1 listed in the following table:

ModBus error	Description
0x02	Illegal address value Address within user block does not exist, invalid user block setup.
0x03	Illegal data value Bad frame format or out-of-range values: – magic number does not match – unsupported sub-command – unsupported user block ID – invalid number of variables – response exceeds max. size of ModBus telegram – no write access – write value out of range – user block setup missing
0x04	Server device failure Unrecoverable error

Tab. 24: Error codes

5.8.1 Example Setup

The example shows a setup of user block with ID 1 and with 4 variables (3 data registers and 1 device settings register).

Command request header						0	1	2	3	4	5	6	7
0x43	0x16	0x64	0x01	0x01	0x04	0xD004		0x0002		0x0100		0x0200	

The response only contains the header.

Response header

0x43	0x01	0x01	0x04
------	------	------	------

Read

The values of a previously defined user block can be accessed by a read request.



Note:

The number of read values shall not exceed the number of variables defined in the setup. A read request to a smaller number of values than the defined number of variables is always possible.

Command request header

0x43	0x16	0x64	0x02	0x01	0x04
------	------	------	------	------	------

The response contains the previously set up values:

Response header				0	1	2	3	4	5	6	7	8	9	10	11	12	13
0x43	0x02	0x01	0x04	0x0002	0x0008c1d				0x00008cf1				0x00000012				

Write

The user block defined in this example provides only one register with write access. Therefore, only a write access with a maximum number of 1 variable is allowed in this case.

Command request header

0x43	0x16	0x64	0x03	0x01	0x01	0	1
						0xD004	

The response only contains the header.

Response header

0x43	0x03	0x01	0x01
------	------	------	------

6 Accessories for installation and operation

The "LCD display for monitoring" and the "Power supply unit for the display and ModBus" must be assembled in accordance with the supplied assembly instructions and in observance of the safety instructions (see section 2 "Safety instructions").



Note:

The display is always the ModBus master. No other ModBus master is possible when it is installed.

6.1 Installation of the power supply unit for the display and ModBus

Establish a connection between the NH measurement module and the "Power supply unit for the display and ModBus":

- Connect one end of an RJ 45 cable with any ModBus connection of the NH measurement module.
- Connect the other end of the RJ 45 cable with the **ModBus-IN** connection on the "Power supply unit for the display and ModBus".
- Connect further NH measurement modules in series with the 1st NH measurement module.



Note:

Connection cables with various lengths can be purchased from Rittal.

- To supply the NH measurement module independent of the CMC III PU and the busbar system with power, use the adaptor that accompanies the power supply unit.



Note:

You do not need to perform these steps when you use a CMC III PU or when a power supply via the busbar system suffices.

- Connect the adaptor with the "ModBus-OUT" connection on the "Power supply unit for the display and ModBus".
- Connect one end of an RJ 45 cable with the adaptor socket.
- Connect the other end of the RJ 45 cable with any CAN bus connection of an NH measurement module.
- Connect further NH measurement modules in series with the 1st NH measurement module via the CAN bus connections.

6.2 Installation of the LCD display for monitoring

- Connect the "LCD display for monitoring" with the power supply unit for the display and ModBus with the RJ 12 cable that accompanies the LCD display.



Note:

The accompanying cable is 2 metres long. Try to place the power supply unit and display so that the cable length suffices for connecting the devices. Longer cables are commercially available. An RJ 11 cable may also be used.

6.3 Operation of the LCD display for monitoring

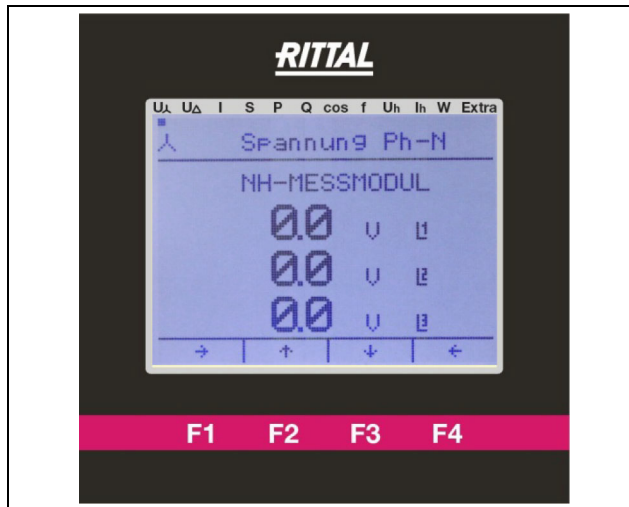


Fig. 7: LCD display for monitoring

The screen display is structured as follows:

- The point on the upper screen edge indicates the currently selected menu item.
- The F1–F4 function keys execute the function shown at the lower screen edge. In the figure: F1 = "→", F2 = "↑", ...
- Navigate with the "→" (F1) and "←" (F4) arrow keys through the various screen display options.
- Navigate with the "→" (F2) and "←" (F3) arrow keys through the NH measurement modules connected to the display.



Note:

For simplification, only the screen display is shown.

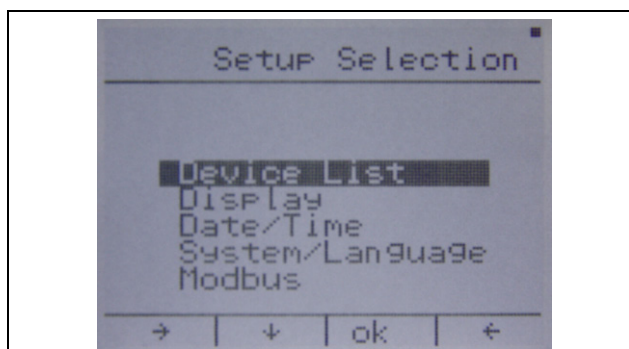
6.3.1 Setup of a measurement module on the LCD display for monitoring



Note:

Each ModBus address may occur just once in a group of measurement modules. A communication error results if two measurement modules with identical ModBus address are connected. In such a case, connect the modules individually and assign different ModBus addresses.

- Navigate with the "→" (F1) or "←" (F4) arrow key to the "Extra" menu item on the "Setup Selection" display and press "OK" (F3) to confirm the "Device List" menu item.

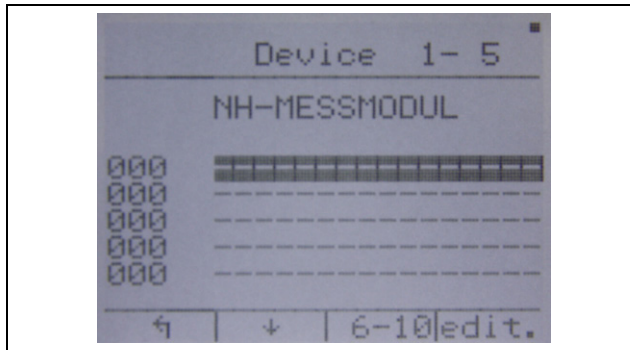


- Select with the "↓" (F2) arrow key a free line (000 -----).

6 Accessories for installation and operation

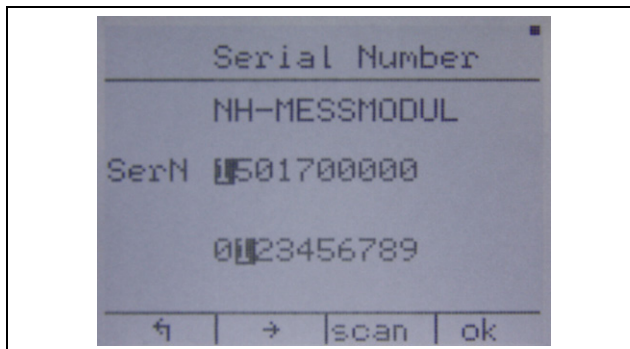
If all entries 1–5 in the list are assigned, the device list 6-10 is opened with the key "6–10" (F3). Device lists 11-15 and 16-20 are opened similarly. Return to list 1-5 by pressing the same key again.

- Confirm the free line by pressing the "edit." (F4) key.



- Enter the serial number (see section 3.5 "Serial number") of the NH measurement module to be added.

The input is made with the "→" (F2) and "OK" (F4) keys.



- Press "OK" (F4) if the currently marked number in the top line "SerN" is correct.
- If the number is not correct, select the correct number in the second line with the "→" (F2) key and confirm with "ok" (F4).
- Repeat this process until the complete serial number has been entered correctly.
- Confirm the serial number with "scan" (F3) key.



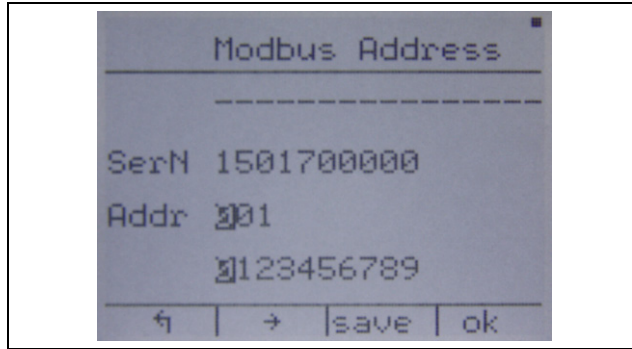
Note:

If you have entered an incorrect number: Confirm repeatedly with "OK" (F4) until the incorrectly specified number is marked again. At the end of the upper "SerN" line, the marking returns to the beginning.

- Enter your specified ModBus address in accordance with the same operating scheme as in the previous step.
- Confirm your input by pressing the "save" (F3) key and wait approx. 5 seconds. The display does not accept any inputs during this time.

6 Accessories for installation and operation

EN



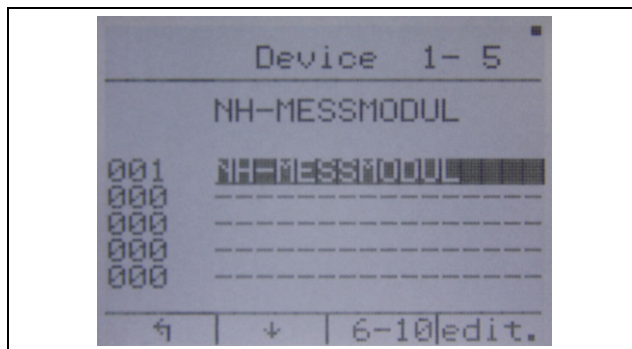
Note:

Permitted values lie in the range 001 to 247. After confirming with "save" (F3), higher values are acknowledged with an error message and not accepted.

If the serial number is not found in the ModBus chain, the following text appears in the lower display edge: "Address not stored".

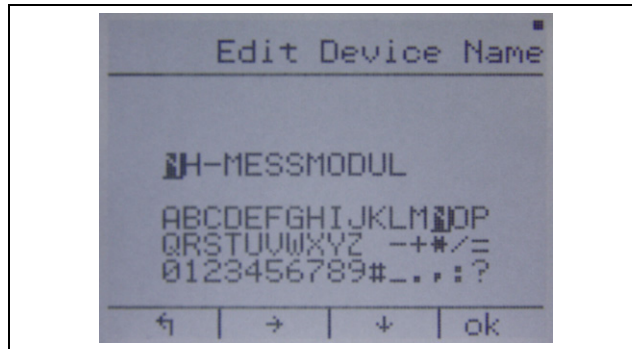
- Check your input of the serial number, all ModBus connections and ensure that the NH measurement module is switched on (see section 4.3.2 "Activating the NH measurement module").

After the successful setup, the NH measurement module is displayed in the device list with the name stored in the device. It is now possible to start the setup of a further device (select an empty line), edit the device ("edit." (F4)) or return to the settings page "↶" (F1).



The "Edit" (F4) selection item provides the following functions:

- Remove the device, "Remv." (F2)
- Add a device with a different serial number at the appropriate position, "Addr." (F3)
- Edit the name of the device, "Name" (F4)
- Press the "ok" (F4) key on the "Edit device name" screen to confirm the currently selected alphabetic character of the upper row.
- Press the "→" (F2) and "↓" (F3) keys to change the currently selected alphabetic character.
- Press the "↶" (F1) key to confirm the entered name.



- Press the "save" (F3) key to store the name.
- Press "edit" (F4) to adapt the changes and "↵" (F1) to discard the changes.

6.3.2 Adaptation of the measurement module topology

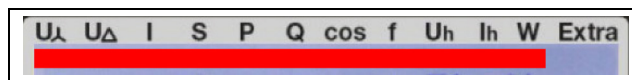


Note:

This setting is made for each individual measurement module.

- Navigate with the "→" (F1) or "←" (F4) arrow key to one of the upper points, except for "Extra".

The point on the upper screen edge must be located at one of the marked elements:



- Navigate with the "→" (F2) or "←" (F3) arrow key to the measurement module to be configured.
- Navigate with the "→" (F1) or "←" (F4) arrow key to the "Extra" menu item on the "Device setup" display and press "ok" (F3) to confirm the "Topology" menu item.
- Press the "↓" (F2) key to select the connection variant to be used and press "ok" (F3) to confirm the selection.
- To exit the menu without changing the topology, press "↵" (F1).



Note:

The above configuration is possible only for a measurement module of the size NH00.

6.3.3 Adaptation of the ModBus baud rate



Note:

Setup all measurement modules on the display before you change the baud rate, because otherwise communications errors result. The default value for the baud rate is 19200.

- Navigate with the "→" (F1) or "←" (F4) arrow key to the "Extra" menu item on the "Setup selection" display, select the "Modbus" menu item with the "↓" (F2) arrow key and press "ok" (F3) to confirm.
- Press the "↓" (F2) key to select the desired baud rate and press "ok" (F3) to confirm.
- To exit the menu without changing the baud rate, press "↵" (F1).

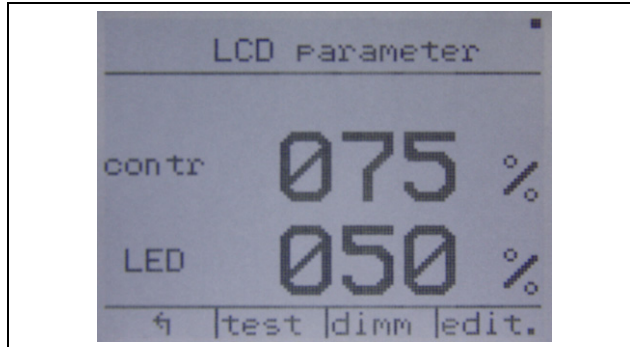
6.3.4 Setting the language of the LCD display for monitoring

- Navigate with the "→" (F1) or "←" (F4) arrow key to the "Extra" menu item on the "Setup selection" display.

- Select with the "↓" (F2) arrow key the "System/Language" menu item.
- Press "ok" (F3) to confirm the menu item.
- Press the "Lang." (F3) key.
- Press the "edit." (F4) key and "↵" (F4) to select the desired language.
- Press "↵" (F1) to confirm and "↵" (F1) to return to the setting menu.

6.3.5 Setting the display illumination

- Navigate with the "→" (F1) or "←" (F4) arrow key to the "Extra" menu item on the "Setup selection" display.
- Select with the "↑" (F2) arrow key the "Display" menu item and press "ok" (F3) to confirm.



- Press the "edit." (F4) key to change the settings for contrast and illuminance level.
- Press the "-" (F3) and "+" (F4) keys to change the value for the contrast.
- Press the "↓" (F2) key to open the menu for setting the illuminance level.
- Change its value similarly with the "-" (F3) and "+" (F4) keys.
- Press "↓" (F2) again and "Yes" (F3) to save the changes or "No" (F1) to discard the changes.
Note that this confirmation is displayed only when values have been changed.
- Press the "dimm" key to make the settings for the illuminance duration and level for the dimmed status similar to the settings for contrast and illuminance level.
- Press the "↵" (F1) key to return to the menu in order to discard all changes that have not been saved.

7 Storage and disposal

7.1 Storage

If the device are not used for a long period, Rittal recommends that you disconnect it from the mains power supply and protected from damp and dust.

7.2 Disposal

Since all the described products consist mainly of the "housing" and "circuit board" parts, the devices must be passed on to the electronic waste recycling system for disposal.

8 Technical specifications

NH measurement module	NH00	NH1	NH2	NH3
Model No.	9343.070	9343.170	9343.270	9343.370
W x H x D (mm)	102 x 108 x 68	170 x 123 x 92	185 x 123 x 107	214 x 123 x 107
I_n (max. +20%)	150 A	250 A	400 A	600 A

Tab. 25: General technical specifications



Note:

When the upper connection for the NH00 NH measurement module is used, the maximum permissible current I_n reduces by 10% (corresponding $I_n = 135$ A).

Power supply unit for the display and ModBus

Model No.	9343.410
W x H x D (mm)	71 x 91 x 61

Tab. 26: Power supply unit general technical specifications

LCD display for monitoring

Model No.	9343.400
W x H x D (mm)	96 x 96 x 46

Tab. 27: LCD display general technical specifications

8.1 Ambient conditions

8.1.1 NH measurement module ambient conditions

Ambient conditions	
Ambient temperature	-25°C...+55°C
Storage and transport temperature	-25°C...+85°C (storage at the upper or lower temperatures can cause ageing of the capacitors)
Humidity	5%...95% relative humidity, non-condensing
Degree of protection	IP20 / DIN EN 60529
Contamination level	3 according to DIN EN 60947
Height	max. 2000 m above NHN

Tab. 28: NH measurement module ambient conditions

8.1.2 Power supply unit for display and ModBus ambient conditions

Ambient conditions	
Ambient temperature	-5°C...+55°C
Storage and transport temperature	-25°C...+85°C
Humidity	5%...95% relative humidity, non-condensing

Tab. 29: Power supply unit for display and ModBus ambient conditions

Ambient conditions	
Degree of protection	IP20 / DIN EN 60529

Tab. 29: Power supply unit for display and ModBus ambient conditions

8.1.3 Display for monitoring ambient conditions

Ambient conditions	
Ambient temperature	-5°C...+55°C
Storage and transport temperature	-25°C...+85°C
Humidity	5%...95% relative humidity, non-condensing
Degree of protection	IP 51 (front) / DIN EN 60529 IP 41 (housing)

Tab. 30: Display for monitoring ambient conditions

8.2 Electrical specifications

8.2.1 NH measurement module electrical specifications

Electrical specifications	
Power supply voltage (L1–L2)	400 VAC (±10%) 50/60 Hz
Stand-by power consumption (no communication)	< 1 W
IEC protection class	II
Insulation class	CAT III / 300 VAC (DIN EN 61010-1) CAT III corresponds to the distribution level
External power supply	24 VDC (-10% / +20%)
Connection	RJ 45 Rittal CAN, looped-through
Use	Controller and communication optional supply, RTC buffering
Instrumentation voltage inputs	
Phase count	3
Phase - N voltage	230 VAC (±10%)
Phase - phase voltage	400 VAC (±10%)
Input impedance	> 2 MΩ
Frequency	45...65 Hz
Fuse protection	Internal L2 fuse (non-replaceable)
Instrumentation current inputs	
Primary current input	I_n of the NH measurement module, max. 120% I_n
Overcurrent loading	10 x I_n (1 second)
Input impedance	0.071 Ω
Frequency	45...65 Hz

Tab. 31: NH measurement module electrical specifications

Electrical specifications	
Instrumentation inputs (connector)	
Power supply (3 phases)	5-pin edge-socket connector (2 pins not connected)
Power supply (3 phases)	6-pin connector
N connection	2-pin connector

Tab. 31: NH measurement module electrical specifications

8.2.2 Power supply unit for display electrical specifications

Electrical specifications	
Supply voltage	85...265 VAC/VDC 50/60 Hz
Output current	0.42 A
Output voltage	24 VDC

Tab. 32: Power supply unit for display electrical specifications

8.3 Interfaces

8.3.1 NH measurement module interfaces

Interfaces	
CAN bus Rittal-specific as CMC III sensor	Looped-through
Baud rate	100...1000 kbit/s (depending on the cable length)
Common mode rejection	-27...+40 V
Insulation	500 V to RS 485 and USB
ESD	6 kV HBM
Connector	RJ 45 (2 x)
RS 485 RTU (slave)	Looped-through
Baud rate	9.6 ...1000 kbit/s (depending on the cable length)
Common mode rejection	-7...+12 V
ESD	8 kV HBM
Connector	RJ 45 (2 x)
USB OTG	
Version/speed	USB 2.0 / full-speed
Speed	12 Mbit/s
ID pin level	No connection to ID pin: NH measurement module is "device" Jumper from ID pin to GND: NH measurement module is "host"
Device profile	Main memory 64 MB (FAT16)

Tab. 33: NH measurement module interfaces

8 Technical specifications

EN

Interfaces	
Insulation	500 V to CAN bus; none to ModBus RTU
ESD	4 kV HBM
Cable length	Max. 3 m
Connection	Mini-USB AB Conversion via extension cable to USB Micro AB
USB stick power supply	Max. 100 mA

Tab. 33: NH measurement module interfaces

8.3.2 Power supply unit for display interfaces

Interfaces	
1 x ModBus RTU (RJ 12)	

Tab. 34: Power supply unit for display interfaces

8.3.3 Display for monitoring interfaces

Interfaces	
1 x ModBus RTU (RJ 12)	
2 x ModBus RTU (RJ 45)	

Tab. 35: Display for monitoring interfaces

8.4 Measured values

Measured values	Description
Voltage V1/V2/V3	Phase N voltage
Voltage U12/U23/U31	Phase x - phase y voltage
I1/I2/I3/IN current	Phase L1, L2 and L3 currents. Measurement performed by the current converter. Current for N calculated.
Energy consumption: 3P, ΣP 3Q, ΣQ 3S, ΣS	The associated instantaneous value is measured and added to the sum.
Max. AVG P/Q/S	Calculation of the absolute average value for P, Q and S with regard to a 15-minute interval.
cos ϕ	Calculation of the power factor.
THD U/THD I harmonics	Calculation of the harmonics to 31st order; values on request.
Frequency of refreshing the measurement	Every 1 second

Tab. 36: Measured values

8.5 Measurement precision (according to EN 61557-12)

Measurement precision	
Voltage measurement	Class 0.2
Current converter	0.5 (ISO EN 61289-1/2)
Current measurement with converter	Class 1.5
Power measurement with converter	Class 2

Tab. 37: Measurement precision

9 Service

For technical queries, please contact:

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