NELES® ND9000 INTELLIGENT VALVE CONTROLLER

Metso’s Neles ND9000 is a top class intelligent valve controller designed to operate on all control valve actuators and in all industry areas. It guarantees end product quality in all operating conditions with unique diagnostics and incomparable performance features. ND9000 is a reliable and future-proof investment with Metso FieldCare™ life-time support.

KEY FEATURES

- Benchmark control performance on rotary and linear valves
- Reliable and robust design
- Easy commissioning and operation
- Language selection: English, German and French
- Local / remote operation
- Expandable architecture
- Advanced device diagnostics including
  - Self-diagnostics
  - Online diagnostics
  - Performance diagnostics
  - Communication diagnostics
  - Extended off-line tests
  - Intelligent Valve Diamond

Options

- Interchangeable communication options:
  - HART
  - FOUNDATION fieldbus
  - Profibus PA
- Limit switches
- Position transmitter (in HART only)
- Full stainless steel enclosure
- Exhaust adapter

Total cost of ownership

- Low energy and air consumption
- Future proof design allows further options at a reduced cost
- Optimized spares program minimizes spare part inventory
- Retro-fit to existing installations (Neles or 3rd party valves)

Minimized process variability

- Linearisation of the valve flow characteristics
- Excellent dynamic and static control performance
- Fast response to control signal change
- Accurate internal measurements

Easy installation and configuration

- Same device can be used for linear and rotary valves, double and single-acting actuators
- Simple fast calibration and configuration
  - using Local User Interface (LUI)
  - using FieldCare software in a remote location
  - using Distributed Control System (DCS) asset management tools
  - Extensive selection of mounting kits for 3rd party actuators
  - Low power consumption enables installation to all common control systems

Open solution

- Metso is committed to delivering products that freely interface with software and hardware from a variety of manufacturers; ND9000 is no exception. This open architecture allows the ND9000 to be integrated with other field devices to give an unprecedented level of controllability.
- FDT and EDD based multi-vendor support configuration
- Support files for ND9000 are available from our internet pages, at www.metso.com/valves - choose the link: download center
Neles ND9000 in fieldbus networks

- Approved interoperability
- Host interoperability ensured
- FOUNDATION fieldbus ITK version 5.01 certified
- Profibus PA profile version 3.0 PNO certified
- Easy to upgrade; by replacing the HART communication board with a fieldbus communication board
- Excellent maintainability with firmware download feature
- Advanced communication diagnostics
- Digital communication via the fieldbus includes not only the set point, but also the position feedback signal from the position sensor. No special supplementary modules for analog or digital position feedback are needed when using the fieldbus valve controller.
- Back up LAS functionality available in FOUNDATION fieldbus environment
- Input selector and output splitter blocks available in FOUNDATION fieldbus devices allowing advanced distributed control
- Standard function blocks enables the freedom to use the ND9000 intelligent valve controller in either continuous or on-off control applications
- Open and close information is directly available via the fieldbus
- Open and close detection is based on either position measurement (soft limit switch) or mechanical limit switch information

ND9000 mounting on actuators and valves

- Mounted on single and double acting actuators
- Both rotary and linear valves
- Ability to attach options to electronics and mechanics later
- 1-point calibration feature enables mounting without disturbing the process

Product reliability

- Designed to operate in harsh environmental conditions
- Rugged modular design
- Excellent temperature characteristics
- Vibration and impact tolerant
- IP66 enclosure
- Stainless steel enclosure (ND9300)
- Protected against humidity
- Maintenance free operation
- Resistant to dirty air
- Wear resistant and sealed components
- Contactless position measurement

Predictive maintenance

- Easy access to collected data with Metso FieldCare software
- Intelligent Valve Diamond to visualise control valve performance & diagnostics
- Logical trend and histogram collection
- Information collected during process uptime
- Extensive set of off-line tests with accurate key figure calculations
- Fast notifications with on-line alarms
- Condition monitoring tool available

Available from Cross Company | Instrumentation Group 865.966.0969

TECHNICAL DESCRIPTION

The ND9000 is a 4–20 mA or fieldbus powered microcontroller-based intelligent valve controller. The device contains a Local User Interface (LUI) enabling local configuration. A PC with FieldCare software can be connected to the ND9000 itself or to the control loop.

The powerful 32-bit microcontroller controls the valve position. The measurements include:

- Input signal
- Valve position with contactless sensor
- Actuator pressures, 2 independent measurements
- Supply pressure
- Spool valve position
- Device temperature

Advanced self-diagnostics guarantees that all measurements operate correctly. After connections of electric signal and pneumatic supply, the micro controller (μC) reads the input signal, position sensor (α), pressure sensors (Ps, P1, P2) and spool position sensor (SPS). A difference between input signal and position sensor (α) measurement is detected by control algorithm inside the μC. The μC calculates a new value for prestige (PR) coil current based on the information from the input signal and from the sensors. The changed current to the PR changes the pilot pressure to the spool valve. Reduced pilot pressure moves the spool and the actuator pressures change accordingly. The spool opens the flow to the driving side of the double diaphragm actuator and opens the flow out from the other side of the actuator. The increasing pressure will move the diaphragm piston. The actuator and feedback shaft rotate. The position sensor (α) measures the rotation for the μC. The μC using control algorithm modulates the PR-current from the steady state value until the new position of the actuator, according to the input signal, is reached.
**Technical Specifications**

**ND9000 Intelligent Valve Controller**

### General

- Loop powered, no external power supply required.
- Suitable for rotary and linear valves.
- Actuator connections in accordance with VDI/VDE 3845 and IEC 60534-6 standards.
- Flush mounting on selected actuators
- Action: Double or single acting
- Travel range: Linear; 10–120 mm / 0.4-4.7 in; rotary; 45–95 degrees. Measurement range 110° with freely rotating feedback shaft.

### Environmental Influence

- Standard temperature range: -40° – +85 °C / -40° – +185 °F
- Influence of temperature on valve position: 0.5 % /10 °K
- Influence of vibration on valve position: < 1 % under 2g 5–150 Hz, 1g 150–300 Hz, 0.5g 300–2000 Hz

### Enclosure

- Material: ND9100: Anodized aluminum alloy and polymer composite
- ND9200: Anodised aluminum alloy and tempered glass
- ND9300: Full 316 stainless steel
- Protection class: IP66, Nema 4x
- Pneumatic ports: G 1/4 (ND9100)
  - 1/4 NPT (ND9200 and ND9300)
- Cable gland thread: M20x1.5 (ND9000 )
  - 1/2 NPT ((ND9000E2, ND9000U1 and ND9000U2)
- Weight: 1.8 kg / 4.0 lbs (ND9100)
  - 3.4 kg / 7.5 lbs (ND9200)
  - 8.6 kg / 19.0 lbs (ND9300)
- Mechanical and digital position indicator visible through main cover, not applicable to ND9200E2 and ND9300. Special corrosion resistant design or stainless steel housing available as an option for demanding environment.

### Pneumatics

- Supply pressure: 1.4–8 bar / 20–115 psi
- Effect of supply pressure on valve position: < 0.1 % at 10 % difference in inlet pressure
- Air quality: Acc. to ISO 8573-1
  - Solid particles: Class 5 (3 – 5 μm filtration is recommended)
  - Humidity: Class 1 (dew point 10 °C/18 °F below minimum temperature is recommended)
  - Oil class: 3 ( or < 1 ppm)
- Capacity with 4 bar / 60 psi supply: 5.5 Nm³/h / 3.3 scfm (spool valve 2)
  - 12 Nm³/h / 7.1 scfm (spool valve 3)
  - 38 Nm³/h /22.4 scfm (spool valve 6)
- Consumption with 4 bar / 60 psi supply in steady state position: < 0.6 Nm³/h /0.35 scfm (spool valve 2 & 3)
  - < 1.0 Nm³/h /0.6 scfm (spool valve 6)

### Electronics

- HART
  - Supply power: Loop powered, 4–20 mA
  - Minimum signal: 3.6 mA
  - Current max : 120 mA
  - Load voltage: up to 9.7 VDC/20 mA
  - Voltage: max. 30 VDC
  - Polarity protection: -30 VDC
  - Over current protection: active over 35 mA
- Profinet and FOUNDATION fieldbus
  - Supply power: voltage 9–32 VDC, reverse polarity protection
  - Max basic current 17.2 mA
  - Fault current (FDE) 3.9 mA
- FOUNDATION fieldbus function block execution times
  - AO: 20 ms
  - PID: 25 ms
  - DO: 15 ms
  - DI: 15 ms
  - IS: 15 ms
  - OS: 20 ms

### Performance with moderate constant-load actuators EC05-EC10 in ambient temperature

- Dead band acc. to IEC 61514: ≤ 0.1 %
- Hysteresis acc. to IEC 61514: < 0.5 %

### Local User Interface (LUI) functions

- Local control of the valve
- Monitoring of valve position, target position, input signal, temperature, supply and actuator pressure difference
- Guided-startup function
- LUI may be locked remotely to prevent unauthorised access
- Calibration: Automatic / Manual linearization
- 1-point calibration
- Control configuration: aggressive, fast, optimum, stable, maximum stability
- Configuration of the control valve
  - Rotation: valve rotation clockwise or counter-clockwise to close
  - Dead Angle
  - Low cut-off, cut-off safety range (default 2 %)
  - Positioner fail action, open/close
  - Signal direction: Direct/reverse acting
  - Actuator type, double/single acting
  - Valve type, rotary/linear
  - Language selection: English, German and French

### Position Transmitter (optional)

- Output signal: 4–20 mA (galvanic isolation; 600 VDC)
- Supply voltage: 12–30 VDC
- Resolution: 16 bit / 0.244 μA
- Linearity: < 0.05 % FS
- Temperature effect: < 0.35 % FS
- External load: max 0–780 Ω
  - max 0–690 Ω for intrinsically safe
- Ex ia IIC T6
  - Ui ≤ 28 V
- Ex d IIC T4/T5/T6
  - Ui ≤ 30 V
## APPROVALS AND ELECTRICAL VALUES, HART

### ATEX

<table>
<thead>
<tr>
<th>Certificate</th>
<th>Approval</th>
<th>Electrical values</th>
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| ND X        | VTT 09 ATEX 033X | II 1G Ex ia IIC T6…T4 Ga
| VTT 09 ATEX 034X | II 1D Ex ta IIC T90 °C Da
| EN 60079-0: 2009/2012 | II 2 G Ex ib IIC T6…T4 Gb
| EN 60079-26: 2007 | II D Ex ib IIC T90 °C Db |
| Input: U ≤ 28 V, I ≤ 120 mA, P ≤ 1 W, C ≤ 22 nF, L ≤ 53 μH | Output: P ≤ 690 Ω |

### IECEx

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| IECEx VTT 10.0005X | Ex ta IIC T90 °C Da
| IEC 60079-0: 2007/2011 | Ex ib IIC T6…T4 Gb
| IEC 60079-1: 2007 | Ex tb IIC T90 °C Db |
| Input: U ≤ 28 V, I ≤ 120 mA, P ≤ 1 W, C ≤ 22 nF, L ≤ 53 μH | Output: P ≤ 690 Ω |

### INMETRO

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| ND E1       | NCC 12.0795 X | Ex d IIC T6…T4 Gb
| NCC 12.0794 X | Ex tb IIC T90 °C…T105 °C Db |
| Input: U ≤ 30 V | Output: P ≤ 780 Ω |

### cCSAus

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<th>Electrical values</th>
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| ND U        | Pending | I S Class I, Division 1, Groups A, B, C, D, T4…T6
| Ni Class L, Zone 0, Ex ia, IIC T4…T6 | Input: U ≤ 28 V, I ≤ 120 mA, P ≤ 1 W, C ≤ 22 nF, L ≤ 53 μH |
| Output: P ≤ 690 Ω |

### TIIS (JIS)

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Available from Cross Company | Instrumentation Group
865.966.0969
## APPROVALS AND ELECTRICAL VALUES, FOUNDATION fieldbus and Profinet PA

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Available from Cross Company | Instrumentation Group 865.966.0969
Electromagnetic Protection
Electromagnetic compatibility
Emission acc. to EN 61000-6-4 (2007)
and FCC 47 CFR PART 15,
SUBPART B, CLASS B (1994)
Immunity acc. to EN 61000-6-2 (2005)

PROXIMITY SENSORS AND LIMIT SWITCHES
(OPTIONAL WITH EXTENSION MODULE FOR ND9100,
ND9200 & ND9300)

Code D33  SST Sensor Dual Module
Code D44  Namur Sensor Dual Module
Code I02  P+F NJ2-12GK-SN, 2 sensors
Code I09  P+F; NCB2-12GM35-N0
Code I32  Omron E2E-X2Y1, micro switch, 2 sensors
Code I45  P+F NJ3-13GK-S1N, 2 sensors
Code I56  IFC 2002-ARKG/UP, 2 sensors
Code K05  Omron D2VW-5, micro switch, 2 sensors
Code K06  Omron D2VW-01 gold plated, micro switch
Code B06  Omron D2VW-01 gold plated, micro switch, 2 sensors.
(Bus powered, no external power and cabling needed).

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Fig. 1. Local User Interface (LUI) enables real time awareness of control parameters in the device at a glance.

Fig. 2. The Performance View of the Metso Valve Manager graphically displays indexes of the valve, actuator and positioner, as well as indexes of control performance and the application environment. Report will show explanations of the status of each component and guidelines for recommended actions.

Available from Cross Company | Instrumentation Group
865.966.0969
DIMENSIONS

ND9100
ND9100/I, ND9100/K and ND9100/B

ND9200
ND9200/I, ND9200/K and ND9200/B

Option J
Option J (pending)
The feedback lever according to actuator ND930_E1: M20x1.5/1/2 NPT (CONDUIT ENTRY NIPPLE)

ND9300/I, ND9300/K and ND9300/B

ND9300

Option J

Available from Cross Company | Instrumentation Group
865.966.0969
### HOW TO ORDER

#### INTELLIGENT VALVE CONTROLLER ND9000 / LIMIT SWITCH (ND9000/D__, ND9000/I__, ND9000/K0__ or ND9000/B06)

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<td>E1</td>
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#### 1. PRODUCT GROUP
- **ND** Intelligent Valve Controller

#### 2. SERIES CODE
- **9** Series 9000 valve controller with universal shaft and attachment face according to standard VDI/VDE 3845. Relevant shaft adapter included in mounting kits. When valve controllers are separate deliveries, adapter kit is supplied.

#### 3. ENCLOSURE
- **1** Standard IP66 / NEMA 4X enclosure.
- **2** Flameproof (Ex d) IP66 / NEMA 4X enclosure.
- **3** Stainless steel Flameproof (Ex d) IP66 / NEMA 4X enclosure.

#### 4. SPOOL VALVE

#### 5. COMMUNICATION / INPUT SIGNAL RANGE
- **H** 4–20 mA, HART communication. Supply voltage 30 V DC. Load voltage: up to 9.7 V DC at 20 mA corresponding to 485Ω (maximum voltage drop).
- **F** FOUNDATION fieldbus, physical layer according to IEC 61158-2.
- **P** Profibus PA, physical layer according to IEC 61158-2.

#### 6. APPROVALS OF STANDARD ENCLOSURE VALVE CONTROLLER

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<td>E1</td>
<td>ATEX and IECEx certifications:</td>
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<td>E2</td>
<td>cCSAus certification:</td>
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<td>E3</td>
<td>TIIS (JIS) certifications:</td>
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<td>E4</td>
<td>INMETRO certification:</td>
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#### 7. APPROVALS FOR HAZARDOUS AREAS

| N | No approvals for hazardous areas. M20 x 1.5 conduit entry. Temperature range -40° to +85 °C. Not applicable to 3. sign "20". |
| X | ATEX and IECEx certifications:                   |
| X | cCSAus certifications (pending):                 |
| X | TIIS (JIS) certifications:                      |
| X | INMETRO certification:                          |

#### 8. LIMIT SWITCH

| Z | Available without limit switches or with IECEx certified inductive limit switches. M20 x 1.5 conduit entry. With limit switch temperature range is updated according to switch type. |

| A | Temperature range: T4: -40° to +85 °C; T5: < +75 °C; T6: < +60 °C. |
| B | Not applicable to 3. sign "20". |

#### 9. APPROVALS OF STANDARD ENCLOSURE VALVE CONTROLLER

**INMETRO certifications:**
- Ex ia IIC T4/T5/T6 Ga
- Ex ia IIC T4/T5/T6 Gc

**Temperature range:**
- Ex ia IIC T4/T5/T6 Ga: Temperature range: T4: -40° to +85 °C; T5: < +65 °C; T6: < +50 °C.
- Ex ia IIC T4/T5/T6 Gc: Temperature range: T4: -40° to +85 °C; T5: < +75 °C; T6: < +60 °C.

**ATEX and IECEx certifications:**
- Ex ic IIC T4/T5/T6 Gc
- Ex ic IIC T4/T5/T6

**Temperature range:**
- Ex ic IIC T4/T5/T6 Gc: Temperature range: T4: -40° to +85 °C; T5: < +75 °C; T6: < +60 °C.

**TIIS (JIS) certifications:**
- Ex d IIB C6 |

**INMETRO certification:**
- Ex d IIB C6

**Temperature range:**
- Ex d IIB C6: Temperature range: T4: -20° to +60 °C. Not applicable to 5. sign "20". Applicable only to 3. sign "20". Applicable only to 5. sign "H". Not available with any limit switches (8. sign "I" or "K").

**cCSAus certification:**
- Class I, Division 1, Groups A, B, C, D; Class I, Division 2, Groups E, F, G; Class III; T4…T6, Enclosure type 4X

**TIIS (JIS) certifications:**
- Ex d IIB C6

**Temperature range:**
- Ex d IIB C6: Temperature range: T4: -20° to +60 °C. Not applicable to 5. sign "20". Applicable only to 3. sign "20".

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- Class I, Division 1, Groups A, B, C, D; Class I, Division 2, Groups E, F, G; Class III; T4…T6, Enclosure type 4X

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**Temperature range:**
- Ex d IIB C6: Temperature range: T4: -20° to +60 °C. Not applicable to 5. sign "20". Applicable only to 3. sign "20".
7. OPTIONS OF VALVE CONTROLLER

**Internal 2-wire (passive) position transmitter. Analog position feedback signal, output 4–20 mA, supply voltage 12–30 V DC, external load resistance 0–780 Ω.**

**ND91_HXT, ND93_HXT, ND91_HZT, ND93_HZT:**
I 1 G Ex ia IIC T6, T4 Gb
I 1 D Ex ta IIC T80 °C Da
I 2 G Ex ib IIC T6, T4 Gb
I 2 D Ex tb IIC T80 °C Db
Ui ≤ 28 V, li ≤ 120 mA, Pi ≤ 1 W, Ci ≤ 22 nF, Li ≤ 53 μH, external load resistance 0–690 Ω.

**ND91_HXT, ND93_HXT, ND91_HZT, ND93_HZT:**
II 1 G Ex ia IIC T6, T4 Ga
II 1 D Ex ta IIC T80 °C Da
II 2 G Ex ib IIC T6, T4 Gb
II 2 D Ex tb IIC T80 °C Db
Ui ≤ 28 V, li ≤ 120 mA, Pi ≤ 1 W, Ci ≤ 22 nF, Li ≤ 53 μH, external load resistance 0–690 Ω.

**ND91_HU1T and ND93_HU1T:**
I 1 G Ex ia IIC T6, T4 Gc
I 1 D Ex tc IIC T80 °C Da
I 2 G Ex ib IIC T6, T4 Gc
I 2 D Ex tc IIC T80 °C Db
Ui ≤ 30 V, li ≤ 152 mA
II 3 G Ex ia IIC T6, T4 Gc
II 3 D Ex tc IIC T80 °C Db
Ui ≤ 30 V, li ≤ 152 mA, Pmax = device limits itself, Ci ≤ 22 nF, Li ≤ 53 μH, external load resistance 0–690 Ω.

**ND92_HE1T, ND92_HE2T, ND92_HE4T, ND92_HE5T, ND93_HE1T, ND93_HE5T:**
Ui ≤ 30 V, Pmax = device limits itself, Ci ≤ 22 nF, Li ≤ 53 μH, external load resistance 0–780 Ω.

**Applicable to 5. sign “H”**

**Internal junction box for all 4–20 mA wirings, including position transmitter, if applicable. Junction box is connected to the enclosure, 2 pcs. M20 x 1.5 conduit entry.**

**ND91_H and ND93_HC:**
J

**External junction box for all 4–20 mA wirings, including position transmitter, if applicable. Junction box is connected to the enclosure, 2 pcs. M20 x 1.5 conduit entry.**

**ND91_F, ND93_F, ND91_P and ND93_P:**
External junction box for wirings, including option for parallel connection of external surge protector. Junction box is connected to the enclosure, 2 pcs. M20 x 1.5 conduit entry. Applied to 6. sign “N”, “H”, “E” pending.

**Exhaust adapter. ND9100: 1x 1/2 NPT thread, ND9200 and ND9300: 2 x 1/2 NPT thread.**

**Special construction.**

8. LIMIT SWITCH TYPE

**Inductive proximity switches, 2 pcs.**
IP66 / NEMA 4X enclosure. M20 x 1.5 conduit entry (2 pcs.). Option E2: 1/2 NPT conduit entry (2 pcs.).

**ND9100:**
D33 Metso: SST Sensor Dual Module, N0 – 125 V DC / 24 – 125 V AC Temperature range: -40 °C / -40 °C to +179 °F. Applicable to 6. sign “N”, “E1”, “E2” and “E5”.

**ND9200 and ND9300:**
D44 Metso: Namur Sensor Dual Module, N0 – 29 V DC, > 3 mA; < 1 mA. Temperature range: -40 °C / -40 °C to +179 °F. Applicable to 6. sign “N”, “U”, “E1”, “E2” and “E5”.

**Mechanical micro switches, 2 pcs.**
IP66 / NEMA 4X enclosure. M20 x 1.5 conduit entry (2 pcs.). Option E2: 1/2 NPT conduit entry (2 pcs.).

**ND9100:**
K05 Omron E2E-X2Y1, 2-wire type; AC < 100 mA; 24-240 V AC. Temperature range: -40 °C / -40 °C to +185 °F. Not applicable to 6. sign “E4”.

**ND9200 and ND9300:**
K06 Omron E2VW-5, 3 A - 250 V AC, 0.4 A - 125 V DC, 5 A - 30 V DC. Temperature range: -40 °C / -40 °C to +185 °F. Not applicable to 6. sign “E4”.

**Bus powered mechanical micro switches, 2 pcs.**
IP66 / NEMA 4X enclosure. M20 x 1.5 conduit entry (2 pcs.). Option E2: 1/2 NPT conduit entry (2 pcs.).

**ND9100:**
B06 Omron E2VW-01, gold plated contacts; Bus Powered, no external power needed. Temperature range: -40 °C / -40 °C to +185 °F. Not applicable to 6. sign “U” and “E4”.

9. OPTIONS OF LIMIT SWITCH

**Special construction.**
### ADDITIONAL ACCESSORIES

<table>
<thead>
<tr>
<th>FILTER REGULATOR</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>Filter regulator for supply air. Filter size 5 μm. Pressure gauge, scale bar/psi/kPa, basic material brass, nickel plated, housing stainless steel, glycerine filled. Temperature range -40 °C...+82 °C / -40 °F...+180 °F. K option includes a thread nipple 1/4&quot;NPT to 1/4&quot;NPT which is suitable with ND9200 &amp; ND9300 positioner options A3 and A5 (1/4NPT Air Connection).</td>
</tr>
<tr>
<td>K1</td>
<td>Filter regulator for supply air. Filter size 5 μm. Pressure gauge, scale bar/psi/kPa, basic material brass, nickel plated, housing stainless steel, glycerine filled. Temperature range -40 °C...+82 °C / -40 °F...+180 °F. K1 option includes a thread nipple 1/4&quot;NPT to G1/4&quot; which is suitable with ND9100 positioner and with option A1 (G1/4 Air Connection).</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CONDUIT ENTRY NIPPLES</th>
<th>Description</th>
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<tbody>
<tr>
<td>CE07</td>
<td>1/2 NPT conduit entry nipples M20x1.5 / 1/2 NPT (ND9100)</td>
</tr>
<tr>
<td>CE08</td>
<td>R1/2 (PF1/2) conduit entry nipples M20x1.5 / R1/2 (ND9100)</td>
</tr>
<tr>
<td>CE09</td>
<td>1/2 NPT conduit entry nipples Brass M20x1.5 / 1/2 NPT, Exd approved (ND9200)</td>
</tr>
<tr>
<td>CE19</td>
<td>1/2 NPT conduit entry nipples Stainless Steel M20x1.5 / 1/2 NPT, Exd approved (ND 9300)</td>
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<table>
<thead>
<tr>
<th>CABLE GLANDS</th>
<th>Description</th>
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<tbody>
<tr>
<td>Not to be used together with conduit entry nipples (CE_) or cableglands (CG_)</td>
<td></td>
</tr>
<tr>
<td>CG5</td>
<td>M20x1.5 grey/plastic, IP66</td>
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<tr>
<td>CG6</td>
<td>M20x1.5 blue/plastic, IP66, Ex e</td>
</tr>
<tr>
<td>CG42</td>
<td>G 1/2 Conduit entry and Cable entry adapter, JIS approved (ND9200hH)</td>
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<tr>
<td>CG41</td>
<td>1/2 NPT Conduit entry and Cable entry adapter, JIS approved (ND9200hH)</td>
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</tbody>
</table>

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<thead>
<tr>
<th>PRESSURE GAUGES AND CONNECTION BLOCKS</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>A1</td>
<td>Pressure gauges, scale bar/psi/kPa, basic material brass, nickel plated, housing stainless steel, glycerine filled. Temperature range -40 °C...+85 °C / -40 °F...+185 °F. Pneumatic connection block, material AISI 316, anodized grey. Connections G1/4 (S, C1, C2).</td>
</tr>
<tr>
<td>A3</td>
<td>Pressure gauges, scale bar/psi/kPa, basic material brass, nickel plated, housing stainless steel, glycerine filled. Temperature range -40 °C...+85 °C / -40 °F...+185 °F. Pneumatic connection block, material AISI 316, anodized grey. Connections 1/4&quot; NPT (S, C1, C2). Converts also ND91_, connections to 1/4&quot; NPT.</td>
</tr>
<tr>
<td>A5</td>
<td>Pneumatic connection block, converts ND91_, connections to 1/4&quot; NPT. Material AISI 316, anodized grey. Connections 1/4&quot; NPT (S, C1, C2). Only for ND9100.</td>
</tr>
<tr>
<td>A6</td>
<td>Pressure gauges with connections G1/4. Material AISI 316. Only for ND9300</td>
</tr>
<tr>
<td>A7</td>
<td>Pressure gauges with connections 1/4&quot; NPT. Material AISI 316. Only for ND9300</td>
</tr>
<tr>
<td>A10</td>
<td>Pressure gauges with connections 1/4&quot; NPT for ND93_ AISI 316, pressure gauges for severe off-shore use, safety glass window.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CONNECTION PLUGS</th>
<th>Description</th>
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<tbody>
<tr>
<td>Not to be used together with conduit entry nipples (CE_) or cableglands (CG_)</td>
<td></td>
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<tr>
<td>P1H</td>
<td>ND9100H (HART): Connection plug according to M20x1.5 / DIN 43650A (ISO 4400). Not applicable with S.sign “F” and “P”.</td>
</tr>
<tr>
<td>P4H</td>
<td>Valve controller and limit switch with connection plugs (1 + 1 pc) ND9100H (HART): M20x1.5 / DIN 43650A (ISO 4400). ND9100/00 or 2 wire ND91100/00. Not applicable with S.sign “F” and “P”.</td>
</tr>
<tr>
<td>P2F</td>
<td>ND9100F and ND9100F/B06 (FOUNDATION fieldbus): Connection plug male eurofast, Turck FSV49, M20x1.5 / M12. Not applicable with S.sign “F” and “P”.</td>
</tr>
<tr>
<td>P3F</td>
<td>ND9100F and ND9100F/B06 (FOUNDATION fieldbus): Connection plug male minifast, Turck RSFV49, M20x1.5 / 7/8”. Not applicable with S.sign “F” and “P”.</td>
</tr>
<tr>
<td>P2P</td>
<td>ND9100P and ND9100P/B06 (Profibus PA): Connection plug male, Westmuller 842593, M20x1.5 / M12. Not applicable with S.sign “F” and “P”.</td>
</tr>
<tr>
<td>P3P</td>
<td>ND9100P and ND9100P/B06 (Profibus PA): Connection plug male minifast, Turck RSFV48, M20x1.5 / 7/8”. Not applicable with S.sign “F” and “P”.</td>
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</tbody>
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