

Digital positioner

Neles™ ND6000™

Neles ND6000 is a digital positioner designed to operate on all control valve actuators and in all industry areas. ND6000 is a reliable and future-ready investment with life-time support.

Key features

- Benchmark control performance on rotary and linear valves
- Reliable and robust design
- The rugged cover protects the unit from environmental hazards and external abuse
- Easy commissioning and operation
- Language selection: English, German and French
- Local / remote operation
- Basic device diagnostics including
 - Self-diagnostics
 - Deviation trend
 - Counters
 - Extended off-line tests

Total cost of ownership

- Low energy and air consumption
- Retro-fit to existing installations (any valve, regardless of manufacturer)

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 DTM / EDD in a remote location
 - using Distributed Control System (DCS) asset management tools
- Low power consumption enables installation to all common control systems



Open solution

- Valmet is committed to delivering products that freely interface with software and hardware from a variety of manufacturers; ND6000 is no exception. This open architecture allows the ND6000 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 ND6000 are available from our internet page, <https://www.valmet.com/flowcontrol/ND6000>

ND6000 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
- Protected against humidity
- Maintenance free operation
- Resistant to dirty air
- Wear resistant and sealed components
- Contact less position measurement

Technical description

The ND6000 is a 4–20 mA powered microcontroller-based digital positioner. The device contains a Local User Interface (LUI) enabling local configuration.

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

Self-diagnostics guarantees that all measurements operate correctly. After connections of electric signal and pneumatic supply the micro controller (μ C) 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 μ C. The μ C calculates a new value for prestage (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 μ C. The μ C 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.

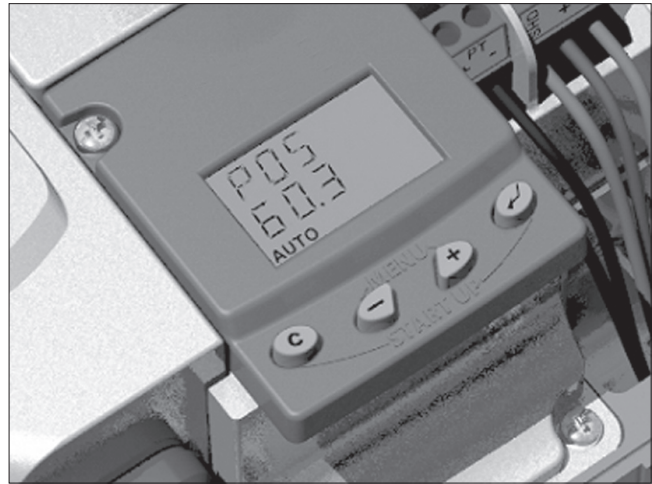
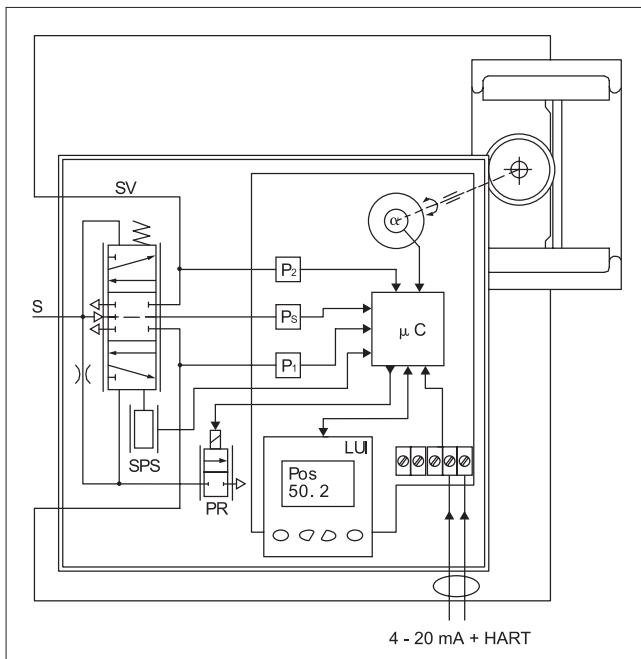


Fig. 1. Local User Interface (LUI) enables real time awareness of control parameters in the device at a glance.

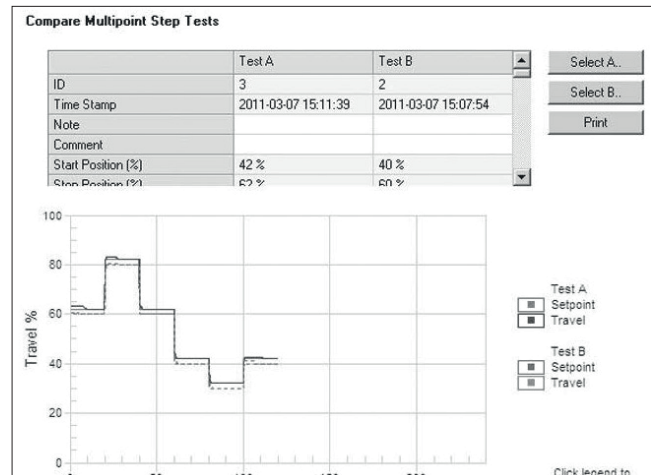


Fig. 2. ND6000 diagnostics includes four Offline Tests. The test results can be compared with earlier tests.

Technical specifications

ND6000 digital positioner

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.

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 °C to +85 °C / -40 °F to +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: ND6100: Epoxy coated anodized aluminum enclosure and cover

Pneumatic ports: G 1/4

Cable gland thread: M20x1.5

Weight: 1.8 kg / 4.0 lbs

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 / 50 °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: 3.7 mA

Current max : 120 mA

Load voltage: up to 9.7 VDC/20 mA (corresponding 485 Ω)

Voltage: max. 30 VDC

Polarity protection: -30 VDC

Over current protection: active over 35 mA

Performance with moderate constant-load actuators

Dead band: ≤0.1 %

Hysteresis: <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 unauthorized access
- Calibration: Automatic / Manual, 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

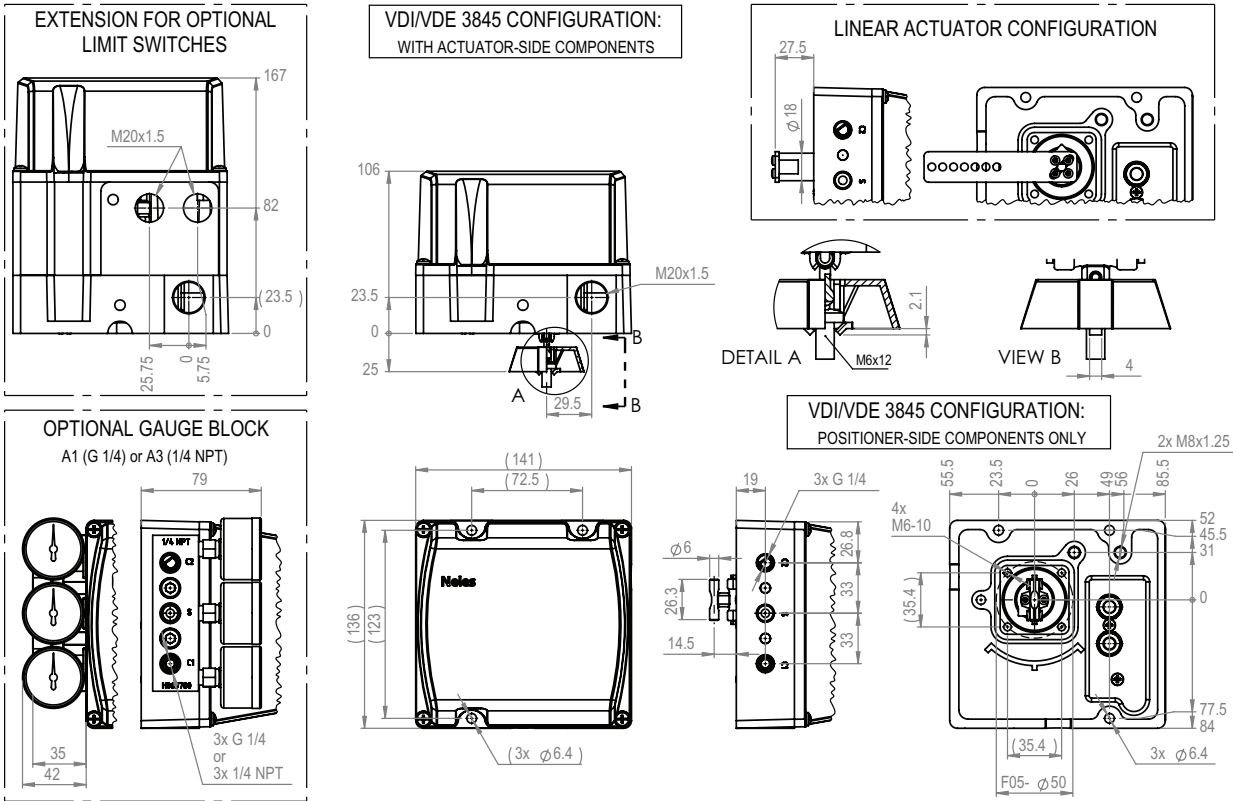
Approvals and electrical values

Certificate	Approval	Electrical values
ATEX (PENDING)		
ND_X EN 60079-0: 2009/2012 EN 60079-11: 2012 EN 60079-26: 2007 EN 60079-31: 2008	II 1G Ex ia IIC T6...T4 Ga II 1D Ex ta IIIC T90 °C Da II 2 G Ex ib IIC T6...T4 Gb II 2 D Ex tb IIIC T90 °C Db II 1G Ex ia IIC T6...T4 Ga	Input: $U_i \leq 28 \text{ V}$, $I_i \leq 120 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$ Output: $U_i \leq 28 \text{ V}$, $I_i \leq 120 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$
EN 60079-0: 2009/2012 EN 60079-11: 2012 EN 60079-15: 2010 EN 60079-31: 2008	II 3 G Ex nA IIC T6...T4 Gc II 3 D Ex tc IIIC T90 °C Dc II 3 G Ex ic IIC T6...T4 Gc II 3 D Ex tc IIIC T90 °C Dc	Input: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$ Output: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$ Input: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$, $P_{\text{max}} = \text{device limits itself}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$ Output: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$, $P_{\text{max}} = \text{device limits itself}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$
IECEx (PENDING)		
ND_X IEC 60079-0: 2007/2011 IEC 60079-11: 2011 IEC 60079-26: 2006 IEC 60079-31: 2008	Ex ia IIC T6...T4 Ga Ex ta IIIC T90 °C Da Ex ib IIC T6...T4 Gb Ex tb IIIC T90 °C Db	Input: $U_i \leq 28 \text{ V}$, $I_i \leq 120 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$ Output: $U_i \leq 28 \text{ V}$, $I_i \leq 120 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$
IEC 60079-0: 2007/2011 IEC 60079-11: 2011 IEC 60079-15: 2010, IEC 60079-31: 2008	Ex nA IIC T6...T4 Gc Ex tc IIIC T90 °C Dc Ex ic IIC T6...T4 Gc Ex tc IIIC T90 °C Dc	Input: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$ Output: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$ Input: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$, $P_{\text{max}} = \text{device limits itself}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$ Output: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$, $P_{\text{max}} = \text{device limits itself}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$
CCC (PENDING)		
ND_X8 GB/T 3836.1-2021, GB/T 3836.3-2021, GB/T 3836.4-2021, GB/T 3836.31-2021	Ex ia IIC T6...T4 Ga Ex ta IIIC T90 °C Da Ex ib IIC T6...T4 Gb Ex tb IIIC T90 °C Db	Input: $U_i \leq 28 \text{ V}$, $I_i \leq 120 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$ Output: $U_i \leq 28 \text{ V}$, $I_i \leq 120 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$
	Ex nA IIC T6...T4 Gc Ex tc IIIC T90 °C Dc	Input: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$ Output: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$
	Ex ic IIC T6...T4 Gc Ex tc IIIC T90 °C Dc	Input: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$, $P_{\text{max}} = \text{device limits itself}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$ Output: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$, $P_{\text{max}} = \text{device limits itself}$, $C_i \leq 13.5 \text{ nF}$, $L_i \leq 53 \mu\text{H}$
INMETRO (PENDING)		
ND_Z ABNT NBR IEC 60079-0:2008 (2011) ABNT NBR IEC 60079-11:2009 ABNT NBR IEC 60079-26:2008 (2009)	Ex ia IIC T4/T5/T6 Ga Ex ia IIC T4/T5/T6 Gb	Input: $U_i \leq 28 \text{ V}$, $I_i \leq 120 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \leq 22 \text{ nF}$, $L_i \leq 53 \mu\text{H}$ Output: $U_i \leq 28 \text{ V}$, $I_i \leq 120 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \leq 22 \text{ nF}$, $L_i \leq 53 \mu\text{H}$
ABNT NBR IEC 60079-27:2010	Ex nA IIC T4/T5/T6 Gc	Input: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$ Output: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$
ABNT NBR IEC 60079-0:2008 (2011) ABNT NBR IEC 60079-11:2009 IEC 60079-15:2010 ABNT NBR IEC 60079-27:2010 ABNT NBR IEC 60529:2009	Ex ic IIC T4/T5/T6 Gc	Input: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$, $P_{\text{max}} = \text{device limits itself}$, $C_i \leq 22 \text{ nF}$, $L_i \leq 53 \mu\text{H}$ Output: $U_i \leq 30 \text{ V}$, $I_i \leq 152 \text{ mA}$, $P_{\text{max}} = \text{device limits itself}$, $C_i \leq 22 \text{ nF}$, $L_i \leq 53 \mu\text{H}$

Also IECEx based CCOE/PESO is pending.

Dimensions

ND6100



How to order Digital positioner ND6000

1.	2.	3.	4.	5.	6.	7.		8.	9.
ND	6	1	03	H	X8	T	/	D45	

1.	PRODUCT GROUP
ND	Neles digital positioner

2.	SERIES CODE
6	Series 6000 digital positioner with universal shaft and attachment face according to standard VDI/VDE 3845. Relevant shaft adapter included in mounting kits. When valve positioners are separate deliveries, shaft adapter kit needs to be ordered separately.

3.	ENCLOSURE
1	Standard IP66 epoxy coated anodized aluminum enclosure with aluminum windowless cover. M20x1.5 conduit entry.

4.	SPOOL VALVE	PNEUMATIC CONNECTIONS (S, C1, C2)
02	Low capacity. Stroke volume of actuator < 1 dm ³ .	G 1/4
03	Medium capacity. Stroke volume of actuator 1–3 dm ³ .	G 1/4
06	High capacity. Stroke volume of actuator > 3 dm ³ .	G 1/4

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 485 Ω (maximum voltage drop).

6.	APPROVALS FOR HAZARDOUS AREAS
N	No approvals for hazardous areas. Temperature range -40 °C to +85 °C.
X	ATEX and IECEx certifications: Ex ia/ib/ic/ec (PENDING)
X8	CCC (Chinese) certification: Ex ia/ib/ic/ec (PENDING)
Z	Inmetro certification: Ex ia/ib/ic/ec (PENDING)

7.	OPTIONS OF POSITIONER
T	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.
L1	Extension housing with additional conduit entries, 2 pcs M20x1.5. Specify with T-option if additional conduit entry is needed.
W	Without LUI

8.	LIMIT SWITCH TYPE
	Inductive proximity switches , 2 pcs. IP66 enclosure. M20 x 1.5 conduit entry (2 pcs.).
D35	Stonel, Dual Module, SST Sensor, 2 switches, NO, 8–250 VDC / 20 – 250 VAC. Temperature range -40 ... +80°C Applicable to 6. sign “N” only
D45	Stonel, Dual Module, NAMUR sensor NC (EN60947-5-6), 2 switches, 5 – 25 VDC, >3 mA; <1 mA Temperature range -40 ... +80°C
	Mechanical micro switches , 2 pcs. IP66 enclosure. M20 x 1.5 conduit entry (2 pcs.).
K05	Omron D2VW-5, 3 A - 250 V AC, 0.4 A - 125 V DC, 5 A - 30 V DC. Temperature range: -40 °C to +85 °C Applicable to 6. sign “N” only.

FILTER REGULATOR	
K1S	Filter regulator for supply air. Filter size 5 µm. Pressure gauge, scale bar/psi/kPa and kg/cm ² , basic material brass, nickel plated, housing stainless steel, glycerine filled. Temperature range -40 °C to +82 °C / -40 °F to +180 °F. K1S option includes a thread nipple 1/4"NPT to G1/4" between filter regulator and positioner which is suitable with ND6100 and with option A1 (G1/4 AIR CONNECTION). Supply air connector in the filter regulator is female 1/4".

CONDUIT ENTRY NIPPLES	
CE07	1/2 NPT conduit entry nipples M20x1,5 / 1/2 NPT

CABLE GLANDS	
CG5	M20x1.5 grey/plastic, IP66
CG6	M20x1.5 blue/plastic, IP66, Ex e

PRESSURE GAUGES	
A1	Pressure gauges with connections G1/4 (S, C1, C2). Gauges AISI304, block AlSiMg.
A1B	Two pressure gauges with connections G1/4 (S, C2). Use in single acting use only. Gauges AISI304, block AlSiMg.
A3	Pressure gauges with connections 1/4 NPT (S, C1, C2). Gauges AISI304, block AlSiMg.
A3B	Two pressure gauges with connections 1/4 NPT (S, C2). Gauges AISI304, block AlSiMg.
A5	Pneumatic connection block for converting connections to 1/4 NPT (S, C1, C2). No gauges. Block AlSiMg.

DRIVER SETS	
DS01	Driver set for ND6100 on actuators with VDI/VDE3845 attachment face. Set includes the G1/4 plug for single acting actuators. The driver set should also be applied with all ND6 with gauge blocks A1 or A1B.
DS13	Feedback set. For stroke lengths 10-80 mm.

PNEUMATIC PLUGS	
PP01	G1/4 plug. Use with gauge blocks A1 for single acting case.
PP02	1/4NPT plug. Stainless steel. Use with gauge blocks A3 or A5 for single acting case.

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