# PROCESS CONTROL SYSTEMS FOR THE PLASTICS PROCESSING INDUSTRY

Precise. Innovative. User friendly.


• INDUSTRY COMPETENCE • 50 Years • since 1975 • Made in Germany •

NOLDEN REGLER®

WIR SIND DAS ORIGINAL

www.nolden-regler.de

Since 1975, NOLDEN controllers are known for precise temperature control in the plastics processing industry. Originated from a small development company for high quality laboratory controllers, NOLDEN designs and produces today precise process control systems mainly for hotrunners and injection moulds. Starting with temperature control in the hotrunner, more and more additional process control, diagnosis and monitoring functions were added – that's how NOLDEN brings you today the whole mould control in just one device. This simplifies a lot the operation and wiring and saves precious space around the injection press. In many cases - as for the neural control algorithm „evoControl®“ or the mould testing device „MouldExpert“ - NOLDEN was the trailblazer for new, innovative technology, shown by numerous patents and industrial property rights. More and more, well known OEM-customers rely on our know-how and get their devices developped and produced by NOLDEN.

## NOLDEN DynaHeat

Our latest innovation: NOLDEN DynaHeat is our answer to the increasingly faster and more sensitive nozzles in modern multi-cavity injection moulds and their hot runners. How does it work? Read more on the following pages.

As a development and production company, we want to be at your service from the very beginning. This starts with individual support to find the best suitable control system, of course with thorough testing cycle in your production environment. Also for future upgrades and function enhancements as well as service and repair – we would like to be your partner for the whole life time of your device.

Kind regards,
**Hans Werner Müller**
Owner and CEO

*Hans Werner Müller, Owner and CEO*

*Christian Stiller, Technical Manager Statutary director*

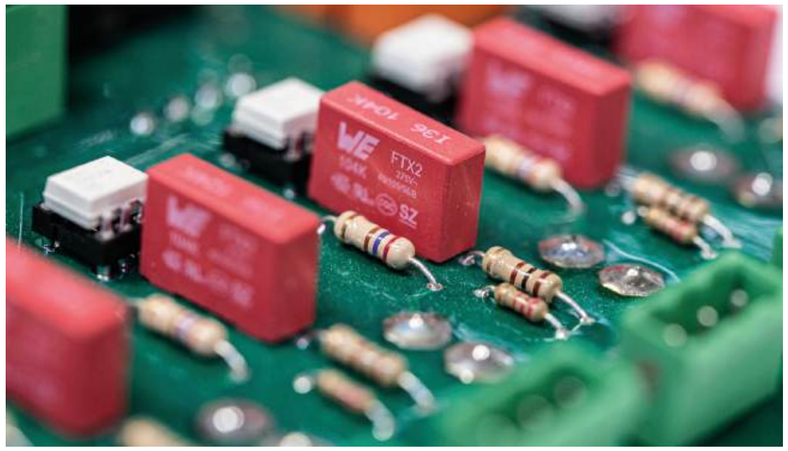


*Our premises in Meckenheim*

# SINCE 1975 AT YOUR SERVICE IN THE PLASTICS PROCESSING INDUSTRY

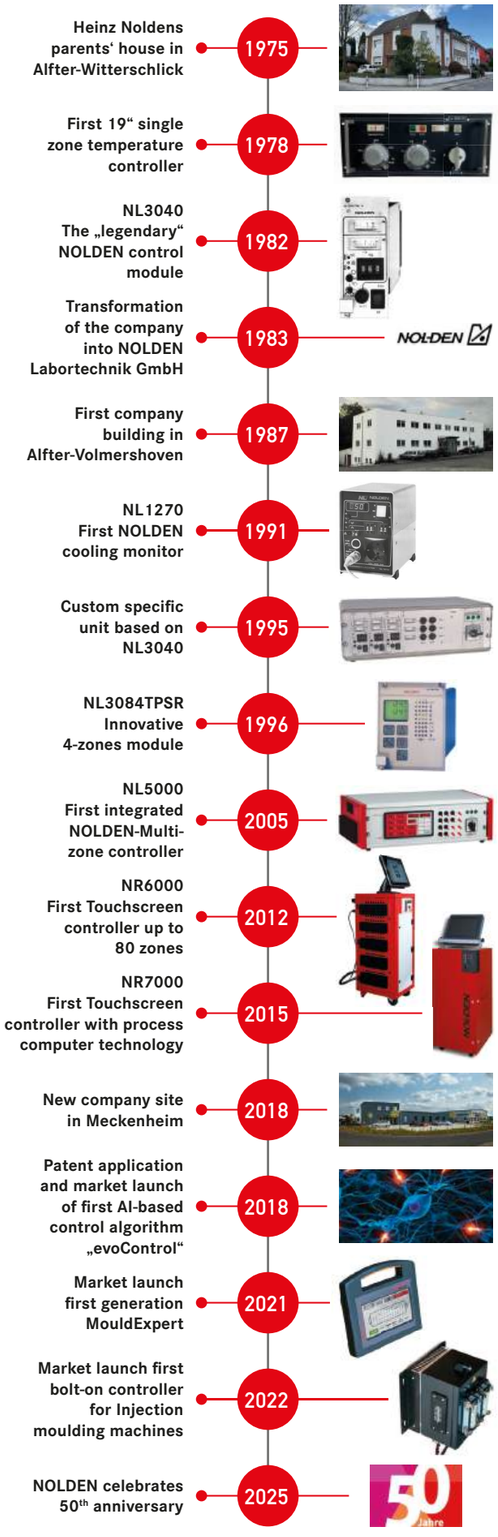
*Assembling and wiring of our control systems*

*Electronics development, circuit board design and production are made by NOLDEN in-house – the only way to guarantee high quality, functionality and durability.*



*High quality masterbatches made from technical composites – this is where everything begins. Until obtaining dimensionally accurate parts with complex functions and perfect visual appearance, you need experience – and perfect process control.*

## CONTENT




# 50 years of NOLDEN – We are the original

In 1975, a young laboratory technician at one of the large chemical plants on the Rhine was dissatisfied with the existing laboratory controllers, which were too imprecise, too complicated and too expensive. Heinz NOLDEN thought he could do better, and in the basement of his parents' house in Alfter-Witterschlick he calculated and developed, exposed and etched circuit boards, and the first laboratory controller was born. The first small company was founded in the family home, and NOLDEN laboratory regulators were soon appreciated for their precision.

Shortly afterwards, another milestone was reached: a new technology was established in plastic injection moulding, known as hot runner technology. Now the temperature had to be precisely measured and controlled at several heating elements, which was the birth of the NOLDEN 19" modular controller. These were quickly recognised and appreciated for their precise temperature control and simple operation, and a renowned Lüdenscheid moulding parts dealer took over worldwide sales. The requirements became ever more stringent and the quantities produced increased, a limited company was founded and the first company building was erected in the home town. The constantly growing requirements were met with many innovative new features, initially with multiple control inserts, and in 2005 with the first integrated multi-zone controller.

In 2010, a younger generation came in and the current owner Hans Werner Müller took over the company. A very powerful process computer concept was introduced, together with intuitive touchscreen operating technology, based on the rapidly spreading smartphones, and systematic collaboration with regional universities. Then, in 2018, a highly acclaimed innovation: evoControl®, the first control algorithm based on artificial intelligence, now patented for NOLDEN. At the same time, the company moved to a newly constructed building in the neighbouring town of Meckenheim. Even now, the pace of innovation remained high, with too many developments to list them all here, NOLDEN is now the most innovative supplier in its sector.

All thanks to you, our loyal customers, we will be happy to accompany you for the next 50 years!





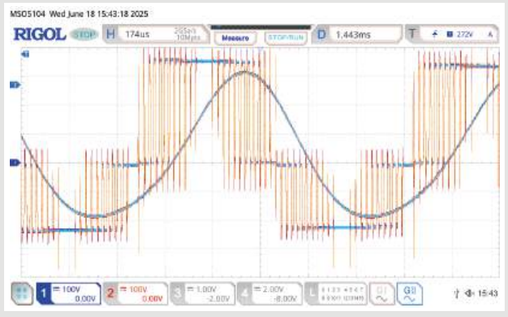
NEW

# INNOVATION BY NOLDEN

## Our solution for maximum speed and precision in temperature control

**NOLDEN DynaHeat**

Every injection moulding specialist knows the problem: hot runner nozzles are getting smaller and smaller and the temperature fluctuates more and more if the temperature is not perfectly controlled and the heating power is not adjusted. At the same time, highly bred plastic compounds are becoming more and more critical and are not forgiving of errors.




*Modulated high frequency signal*

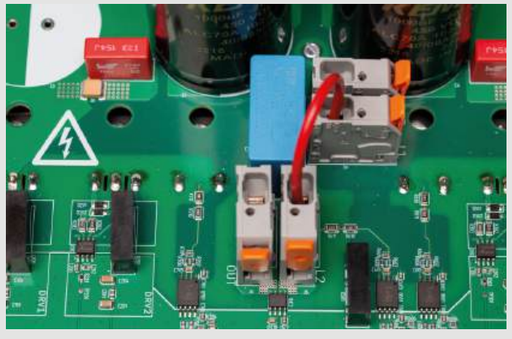
Thanks to the innovative, AI-based evoControl® algorithm, the limits of what is feasible have been reached in the area of temperature control, but what about adjusting the heating power? With the gentle and precise zero-crossing circuit, the limits have now been reached at the prevailing mains frequency of 50 or 60 Hz; the phase control, which is particularly popular in the USA, is inaccurate and, above all, generates a lot of interference in the mains, which is not at all compatible with high demands on electronic temperature measurement data processing.

The solution is as innovative as it is simple: use higher control frequencies and continue to switch precisely at zero crossing.

*Miniaturised hot runner nozzle*

With NOLDEN DynaHeat, the speed of the heating power setting can be increased by a factor of 20! Unfortunately, this frequency cannot be obtained ready-made from the power grid, but must be generated in the device itself. The new „DynaHeat" technology, for which NOLDEN has applied for a patent, is designed to achieve this economically and affordably.

We will continue to equip plastics processing with state-of-the-art technology with the fastest possible and yet affordable precision electronics!



*Electronic inverter circuit*

# NOLDEN evoControl®

## A quantum leap in control technology

*That's how mother nature assures control: A network of neurons exchanges information as small stimuli and determines control reactions in a very precise manner.*

In the field of plastic processing, it's very often temperature to be controlled precisely, as it is of great significance for the viscosity and thus process behaviour of molten plastic aggregates. Here, mostly so-called PID controllers are used, which combine Proportional, Integral and Differential behaviour to calculate the needed heating power adjustments. Alas!, this proven method features two big disadvantages, as everyone working in the plastic business knows well.

**1. OVERSHOOT:** Before stabilizing at the desired set-point, temperature over- and undershoots several times, they also say: "The controller gets tuned".

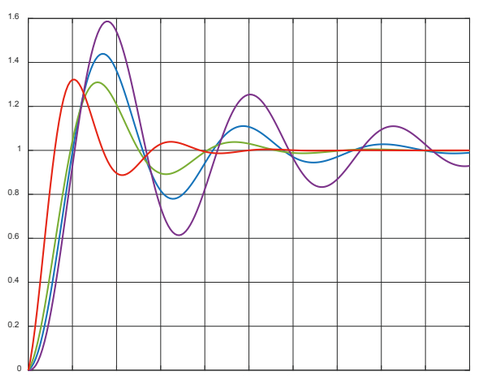
**2. COMPUTING PID-VALUES:** To work precisely with a given hotrunner or mould, one must program the controller with the appropriate P-, I- and D-parameters. This should be done preferably without the interference of the operator, therefore, several so-called self-optimizing or "autotuning" methods exist.

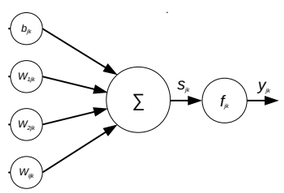
In many cases, this works properly and the temperature remains stable, in other cases, it doesn't and the process is oscillating up and down.

That's why numerous attempts were made to overcome those drawbacks. NOLDEN engineers and research people looked for a completely new approach and found it in nature. In biology and neurochemistry, control operations are performed by so-called neurons, combined to huge networks. Every single neuron only performs a limited part of the total operation, the precision of the overall result is obtained by the number of neurons in the network. In addition, a fundamental advantage of neuronal networks is their ability to get "trained", the propagation parameters of every neutron can adapt themselves to prevailing circumstances. NOLDEN is proud to present with NOLDEN evoControl® the first process control system without any overshoot evoControl® is patented for NOLDEN.

**Problem** | **Solution**

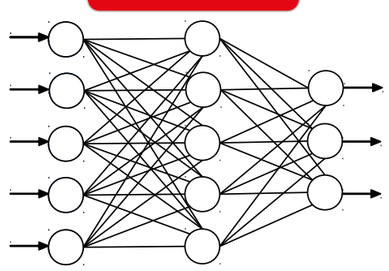
*This problem of conventional PID-control is well-known to everyone in the plastic processing world: Strong overshoot of actual temperature depending of the responsivity of the hotrunner or mould.*




*The solution: An artificial neuronal network as a mathematical model, single neurons are computing a small part of the control algorithm very quickly, the total result is obtained by the networking action of all neurons.*

**evoControl®**








# NOLDEN MouldExpert

## Compact mould testing device for electrical hotrunner elements

**APPLICATION**
NOLDEN MouldExpert checks the pin assignment of any arbitrary 24- or 16-pole mould connector, identifies the different elements (heater or thermocouple) and shows their operational state and characteristics. Shortage to ground on one of the pins is identified and indicated as well. The testing result is displayed on a large, bright colour touchscreen and may be downloaded as an EXCEL file via USB-plug.

**DESIGN**
Measurement electronics and high contrast 7" touch-display are mounted in a rugged, portable plastic casing. The device is drived by a set of rechargeable batteries, which allows to be carried to any location. Charging takes place with a standard USB-C charger on any house-hould wall plug.

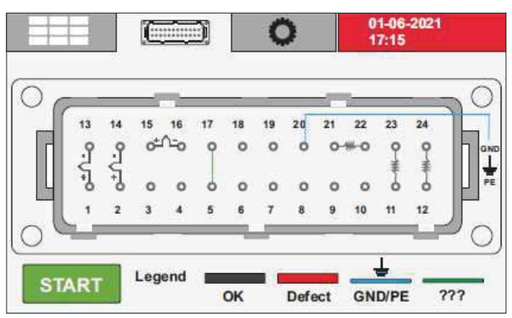
**FUNCTION**
MouldExpert is a fully automated multimeter, which measures every connector pin against every other pin as well as against earth. If a thermocouple or a heater is identified, the correspondant electrical symbol is drawn graphically between the associated connector pins on a picture of the chosen connector.

In case of an earth shortage, a line from this pin to ground is drawn. All results can also be displayed as a table, in this case, beside the electrical symbol, resistance (Ohm) as well as power (W, A, rated to 230V) is depicted in case of a heater. This table can be exported with one push of a button as an EXCEL-file (csv) via the build-in USB-socket.

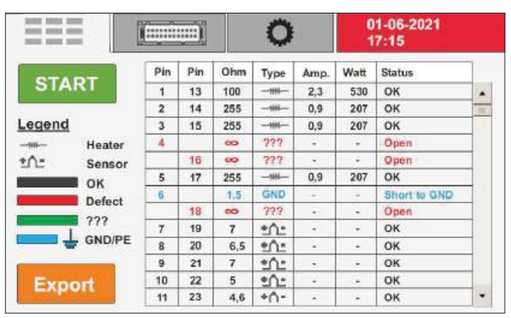
One 24-pole or alternatively one 16-pole connector cable comes standard with the device, others are available on demand. Nevertheless, the number of measurement channels is limited to 24 + Ground.


- Battery driven, can be used far from electrical power supply
- Checks all elements wired to the connector
- 16- or 24-pole connector can be selected
- Grafical or table view, can be exported as EXCEL-file via USB

*Example graphical view with 24-pole connector*




*Example table view with 24-pole connector*




| Pin | Pin | Ohm | Type | Amp. | Watt | Status |
|---|---|---|---|---|---|---|
| 1 | 13 | 100 | | 2,3 | 530 | OK |
| 2 | 14 | 255 | | 0,9 | 207 | OK |
| 3 | 15 | 255 | | 0,9 | 207 | OK |
| 4 | | ∞ | ??? | - | - | Open |
| | 16 | ∞ | ??? | - | - | Open |
| 5 | 17 | 255 | | 0,9 | 207 | OK |
| 6 | | 1,5 | GND | - | - | Short to GND |
| | 18 | ∞ | ??? | - | - | Open |
| 7 | 19 | 7 | | - | - | OK |
| 8 | 20 | 6,5 | | - | - | OK |
| 9 | 21 | 7 | | - | - | OK |
| 10 | 22 | 5 | | - | - | OK |
| 11 | 23 | 4,6 | | - | - | OK |

# NOLDEN MULTIFUNCTION CONCEPT

## All process controll functions in just one box

It has to be easy - easy to install and easy to operate! Inspired by this vision, the NOLDEN multifunction concept was born, to combine all necessary control functions in the mould as well as in the hotrunner in just one box. This means less space needed around the injection moulding machine, less wiring and simpler data management for all functions. One more advantage – the box “moves on with the mould” and can be used on every suitable injection press, this gives you more flexibility in production planning.

## COOLING

### Detail monitoring of all cooling ducts

Effective mould cooling is key for good quality of the parts. To obtain economical cycle times, a simple bridging of all cooling ducts is often not sufficient, here, a good solution is the parallel flow of all ducts with the proven **ORCA**-cooling water distributor. Visualization and automatic alarms for all flow rates and temperatures are done directly on the NOLDEN touchscreen system.

*Servo cables: Motor- and encoder cables connected to the hotrunner controller*

## SERVO CONTROL

### Servo motion control directly from the hotrunner controller

Servo drives are conquering the mould technology at a high pace, where they replace classical hydraulic or pneumatic actuators – with high speed, great precision and low maintenance needs. All common servo drives can directly be connected to NOLDEN NR8000 hotrunner controllers. Suitable as well for linear as for rotatory movements, the screen visualization mode adapts itself automatically.




## VALVE GATE CONTROL

### Sequential control of valve gates

For large parts or thin walls, hotrunner valve gates have often to be controlled sequentially, no problem with the integrated NOLDEN valve gate control system. Operation can be either time based or based on the position of the injection press screw, also, you can program several needle movements per injection cycle. Data exchange with the press can be done via the core puller interface (EUROMAP) or with programmable in-/ and outputs.

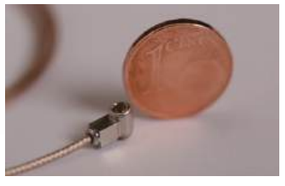
## CAVITY MOULD

## PRESSURE MEASUREMENT

### Monitoring of cavity mould pressure directly on the hotrunner controller

Measuring the cavity mould pressure is now state of the art – Alas! quite expensive and often not easy to operate. With NOLDEN, just connect the pressure sensors directly to the hotrunner controller, visualization and monitoring of the pressure curves are then done on the touchscreen of the controller. Direct action sensors (in the cavity) as well as indirect action sensors (under the ejector pin) can be used, no matter from which manufacturer. Integrated monitoring system patented for NOLDEN Regelsysteme.

Baumer
Passion for Sensors



*Indirect action sensors: Sensors for use under the ejector pin by BAUMER of Switzerland*

*Cavity pressure sensors: Direct action piezo pressure sensors by BAUMER of Switzerland*

# TOUCHSCREEN CONTROLLER

## All control and monitoring functions for the hotrunner in one device

Easy, user friendly operation is of great significance in injection moulding – so many systems and increasing complexity are a challenge for most operators.

That's why simple, intuitive operation was on top of the list when we developed the NOLDEN STS – SmartTouch System. All functions as hotrunner heating, mould cavity pressure measurement or servo motion control are operated in a similar manner – and all mould data are stored in one common recipe memory.

All touchscreen controllers NR8000 are using evoControl©, existing systems can be upgraded.

evoControl®


**Series NR 8000Tower**
Tower casing in 3 sizes, up to 48, 80 or 144 zones


**MouldConnect T**
For 24 or 48 temperature sensors, extension up to 120 zones

# MOULDCONNECT

## The new, innovative mould wiring concept by NOLDEN

Perfectly matching with NOLDEN touchscreen controllers, MouldConnect simplifies drastically the wiring and connection of your mould. Just wire all temperature sensors, pressure transducers and other low voltage lines such as core pullers or proximity switches into the new MouldConnect box. From there, only 1 cable is needed to the control system.

**ONE PLUS ON TOP:** As you connect the cable to the controller, the mould is automatically identified and mould data are loaded, you simply can't do it easier!





# COMPACT-TOUCHDEVICES

## The economic alternative for temperature control

In many cases, a smaller number of temperature control zones is sufficient and complex additional functions are not needed or only required on a limited scale. Here, our compact touchcontroller NR8000-v2 is the ideal solution: The same intuitive, user-friendly NOLDEN Smart Touch System with all features in a compact desktop casing for hotrunners from 12 up to 32 zones. Nevertheless, also for those controllers conventional valvegate control, cavity mould pressure measurement as well as cooling monitoring are available as an option.


**Series NR 8000-v3**
High desktop casing for 24 or 32 zones


**Series NR 8000-v3**
Desktop casing from 8 up to 16 zones

# COMPACT-TOUCHDEVICE MINI

## Comfortable touch operation also for the "little ones"

The great success of our touch controller series NR8000 shows: This device is meeting the expectations of plastic processing professionals. That's why we created a "Mini" version for 4, 6 or 8 zones. Operation and data management are identical for all units up to 120 zones, so, transitioning between the systems is very easy. Sorry, no space left in this very compact casing for additional control functions. But of course, always on board is evoControl©.

evoControl®


**Series NR 8000-v3 Mini**
Mini-Desktop casing for 4, 6 or 8 zones

# BOLT-ON CONTROLLERS

## Multizone-temperature controllers in NOLDEN quality

Often, hotrunner temperature controllers are meant to stay at one injection moulding machine, but complex hotrunner functions and precise control precision must not be missed. Here, our new bolt-on control system comes in very handy.

Together with the new OPC-UA interface technology, the controller is fully integrated into the IMM control system. Older or alternative interface formats are also available. If no interface is present at all, we offer a very compact control panel that can be mounted on the front side of the IMM.

**evoControl®**

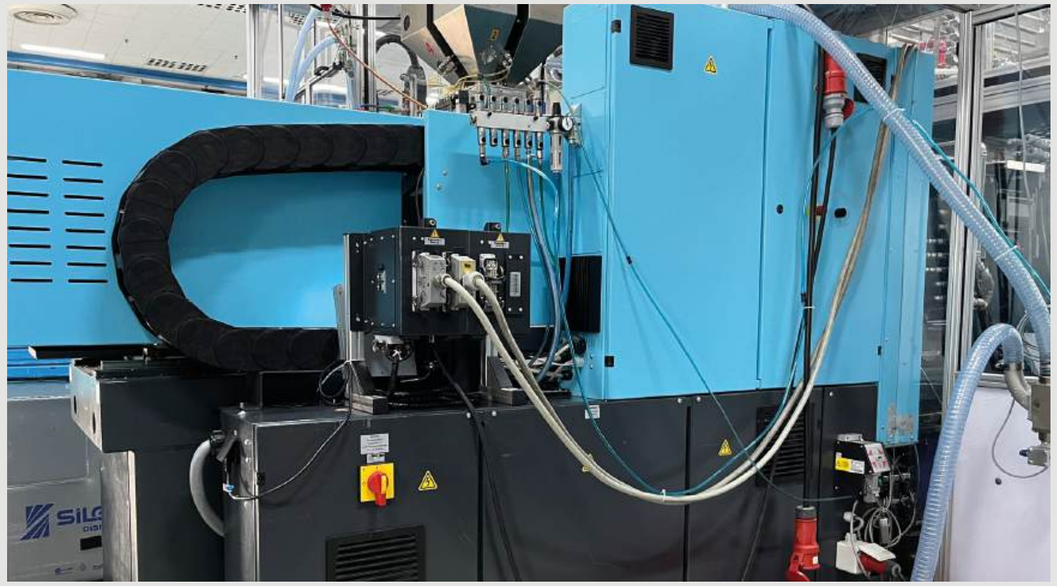
**Series NR 8000 SGM**
Modular hotrunner controller
for 8 zones, can be extended

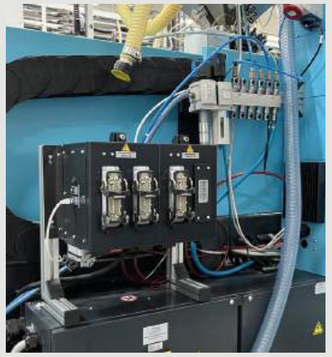
**Separate touchmonitor**
with 5m cable, available
in 10 or 15“ screen size






# BOLT-ON CONTROLLERS IN PRACTICE WITH THE CUSTOMER





# MOULD CONNECTION CABLES

## Mould connection cables made to measure or out of bulk stock

Mould connection cables are needed in any case, whatever control technology is used. NOLDEN produces every cable custom-made, any length, connector type and wiring pin assignment, at very interesting prices. Alternatively, you can order any cable type by the meter.

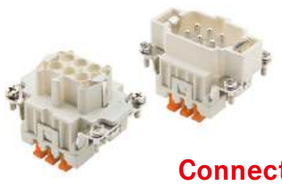
# INDUSTRIAL CONNECTORS

## Following international standards

For the connection of moulds and hotrunners, very often standard industrial connectors are used. However, many different versions exist – heavy and narrow, 3 up to 64 poles, male and female etc.

NOLDEN has virtually every existing standard version in stock, in addition to that, numerous non-standard items, delivered within 24h to you.

**Connector housings**
All versions available ex stock



**Connector inserts**
With proven screw connecting or patented SQUICH quick-lock technology





# ACCESSORIES

## For electrical mould heating – manufacturer independant

Often, time is short, an unplanned repair must by done and spare parts are missing. Good to know that NOLDEN has a broad assortment of thermocouples, heating elements and connectors available ex stock. Compatible to most industries standards, independent from the brand of the injection press and at low prices.

**Thermocouples**
In many variants for moulds and plastics processing machines

**Heating elements**
In brass and stainless steel ex stock, many other variants available on demand

**Heating cardriges**
In all lengths, diameters and connection variants on demand

# MOULD CONNECTION BOXES

## The hands-on solution for trouble-free wiring

Every professional knows the main problem in mould wiring: lack of space! Many wires must be accommodated in the small space of a connector housing. Perhaps, even a wiring change must be performed later on – this is where the proven NOLDEN mould connection boxes come in as a very practical solution.

**Mini mould connection box**
In stainless steel for square mini connectors

**Mould connection box**
NOLDEN design, 3-part-casing, simplifies the wiring of multi-pole connectors

NOLDEN REGLER

www.nolden-regler.de

LRQA 25 YEARS QUALITY MANAGEMENT EXCELLENCE

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