GEFRAN

IN-4000 SET

NOZZLE PRESSURE SENSOR SYSTEM

Operating Manual

C-0111_v1.0_ENG

TABLE OF CONTENTS

PREFACE

Device data

Note the device order code and serial number, which are listed on the label, here:
- applied to the connector for the sensor;
- applied on the back for the indicator.

Should you need technical assistance, they must be communicated to Gefran Customer Service.

IN Sensor	
Serial No.	
Order code	
Indicator	
Serial No.	
Order code	

Warnings and safety

Always make sure you have the latest manual version, that can be freely downloaded from the Gefran website (www.gefran.com).

The devices illustrated in the manual must be installed by qualified technicians, following the laws and regulations in effect and according to the instructions contained in this manual.

Installation and/or maintenance technicians must read this manual and strictly follow the instructions herein and found in the annexes since Gefran cannot be held liable for personal, property and/or product damages should the following conditions not be met.

Disposal

The IN Sensor must be disposed of in accordance with applicable regulations.

Some of the components used in the devices can cause damage to the environment if incorrectly disposed.

Disclaimer

Although all information contained within this document has been carefully checked, Gefran S.p.A. cannot be held liable for the possible presence of errors, or damage to persons or property due to improper use of this manual.

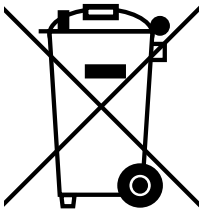
Gefran S.p.A. also reserves the right to make changes to the content and form of this document as well as the characteristics of the illustrated devices at any time without prior notice.

The technical and performance data indicated in this manual are to be considered as a guide for the user to determine the suitability for a certain use, and are not guarantees. They may be the result of Gefran S.p.A. test conditions and the user must compare them to his/her real application requirements.

Gefran S.p.A. cannot be held in any way liable for any damage to persons or property resulting from IN Sensor and indicator tampering, incorrect and improper use or otherwise non compliant with controller features and instructions in this manual.

Copyright

WEEE INFORMATION



DE

„Umsetzung der Richtlinie 2012/19/EU über Elektro- und Elektronik-Altgeräte (EEA)“
Das Symbol der durchgekreuzten Mülltonne auf dem Gerät oder der Geräteverpackung weist darauf hin, dass Sie das Produkt am Ende seines Lebenszyklus separat entsor¬gen müssen.
Die Getrenntsammlung dieses Geräts an seinem Lebenszyklusende wird vom Her¬steller organisiert und besorgt.
Der Nutzer, der das Gerät entsorgen möchte, muss sich daher an den Hersteller wenden, um Auskunft über seine Vorgehensweise zur Getrenntsammlung des Geräts an dessen Lebenszyklusende zu erhalten.
Die entsprechende Getrenntsammlung für die anschließende Zuführung des Altgeräts zum Recycling, zur Wiederaufbereitung und zur umweltverträglichen Entsorgung trägt dazu bei, negative Auswirkungen auf die Umwelt und die Gesundheit zu unterbinden und begünstigt die Wiederverwendung und/oder das Recycling von Werkstoffen, aus denen das Gerät besteht.

EN

“Implementation of Directive 2012/19/EU on waste electrical and electronic equip¬ment (WEEE)”
The symbol showing a crossed-out wheeled bin on equipment or its packaging indicates that the product must be collected separately from other waste at the end of its useful life.
The manufacturer is responsible for organ¬ising and managing the separate collection of this piece of equipment at the end of its useful life.
Users wishing to dispose of the equipment must therefore contact the manufacturer to obtain instructions from the same on how to have the equipment collected separately at the end of its useful life.
By collecting the disused equipment sepa¬rately, it can be recycled, treated or disposed of in an environmentally friendly manner, thus helping to prevent the environment and public health from being affected negatively and enabling reuse and/or recycling of the materials forming the same equipment.

FR

“Transposition de la Directive 2012/19/UE relative aux déchets d’équipements électriques et électroniques (RAEE)”
Le pictogramme de la poubelle barrée, figu¬rant sur l’équipement ou sur son emballage, indique que le produit en fin de vie doit être traité séparément des autres déchets.
Le ramassage sélectif de cet équipement en fin de vie est organisé et géré par le constructeur.
Tout utilisateur qui souhaiterait se débarras¬ser de l’équipement devra donc contacter le constructeur pour obtenir des informations concernant la méthode adoptée pour per¬mettre le ramassage sélectif de l’équipe¬ment en fin de vie.
Un ramassage sélectif correct, en vue de l’acheminement de l’équipement vers des opérations de recyclage, de traitement et de mise au rebut respectueuses de l’environne-ment, contribue à réduire les impacts poten-tiellement néfastes sur l’environnement et la santé, outre à favoriser la réutilisation des matériaux/composants dont l’équipement est constitué.

IT

“Attuazione della direttiva 2012/19/UE sui rifiuti di apparec¬chiature elettriche ed elettroniche (RAEE)”
Il simbolo del cassonetto barrato riportato sull’apparecchiatura o sulla sua confezione indica che il prodotto alla fine della propria vita utile deve essere raccolto separatamen¬te dagli altri rifiuti.
La raccolta differenziata della presente ap-parecchiatura giunta a fine vita è organizza¬ta e gestita dal produttore.
L’utente che desideri disfarsi dell’apparec-chiatura dovrà quindi contattare il produt¬tore per ricevere indicazioni sul sistema da quest’ultimo adottato per consentire la rac¬colta separata dell’apparecchiatura giunta a fine vita.
L’adeguata raccolta differenziata per l’avvio successivo dell’apparecchiatura dismessa al riciclaggio, al trattamento e allo smaltimento ambientalmente compatibile contribuisce ad evitare possibili effetti negativi sull’ambiente e sulla salute e favorisce il reimpiego e/o riciclo dei materiali di cui è composta l’ap¬parecchiatura.

1. GENERAL DESCRIPTION

1.1. Profile

The IN Sensor and its indicator are a system designed to regularly check nozzle pressure, compared to the load cell used behind the screw, principally in fully electric injection moulding machines but also in hybrid or hydraulic machines.

This type of control is especially required if ISO 9000 procedures are followed.

The sensor is compatible with a wide range of moulding machines, thanks to the available nozzle adapters. Sensor application is very fast and requires no intervention on the machine, as it is held in position by magnetic mounting bases.
The high quality steel used for its construction qualifies it as a tool for professional moulding.

The nozzle pressure sensor is installed between the mould and the injection nozzle. It is designed for temporary measurements and cannot be used for continuous injection pressure measurement (in line), as the melt cannot pass through the sensor, which is closed.

In the single-shot measurement procedure, a small amount of melt is injected into the sensor and peak pressure is measured and stored. This peak pressure can then be compared to that of the moulding machine loading cell. Single-shot measurement can be taken with temperatures up to 400° C.

In the multi-shot measurement procedure, a small volume of melt is injected into the sensor which can be kept liquid using the heating tape on the sensor tip. You can select different pressure values at each step. Multi-shot measurement can be taken with temperatures up to 230° C.

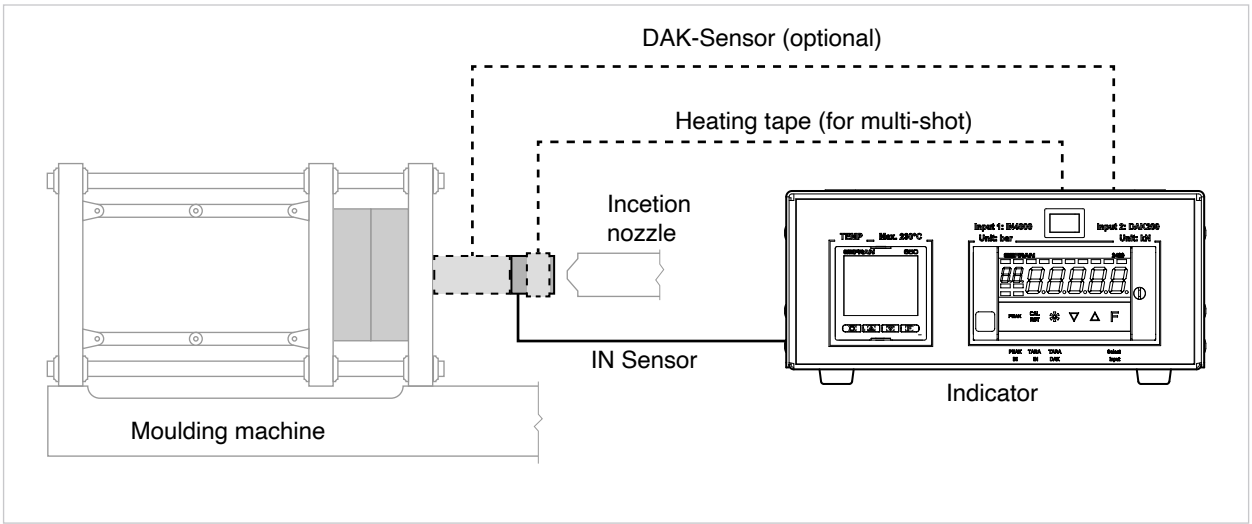
To measure the contact force of the nozzle, you can use the optional DAK sensor, which is mounted on the IN Sensor as a standard.
The indicator is the device that, by means of two distinct instruments, can:

- measure nozzle pressure and force (the optional DAK sensor is required for force);
- adjust the heating tape temperature when this is used.

The indicator is powered by the mains voltage and provides the power required for the sensors and the heating tape.

The digital output allows you to connect the indicator to a computer directly with a serial cable or via an RS232-USB converter. The Gefran NozzleCheck software allows you to measure all signals: injection pressure and peak (IN sensor), contact force and peak (DAK sensor), heating tape temperature.

1.2. System architecture

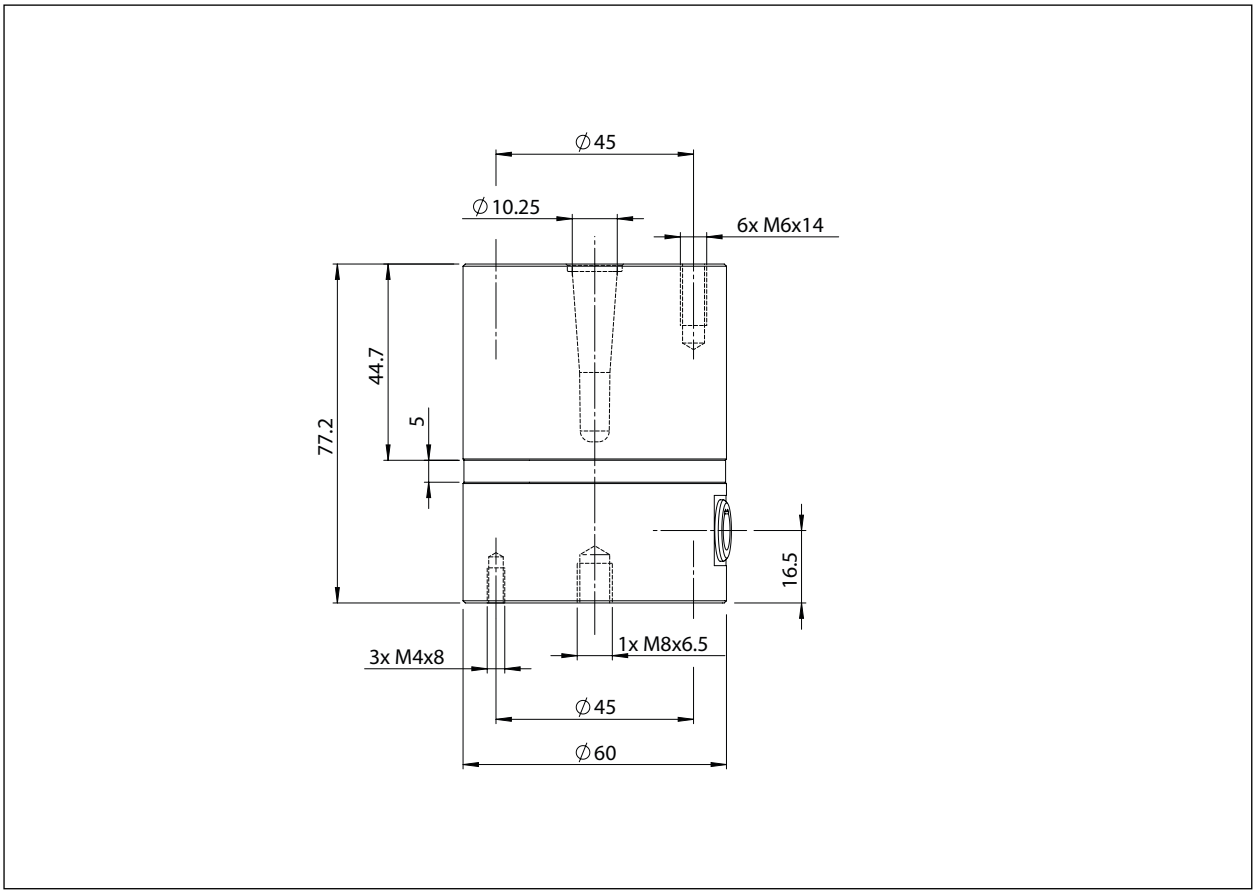


1.3. IN Sensor

Main features

- Nozzle pressure measurements up to 4000 bar with melt temperature up to 400° C.
- Multi-shot measurements with different pressure levels at ≤230° C temperatures.
- Simple magnetic installation without screws.
- Possibility to use together with DAK nozzle contact force sensor.
- Ideal for service/R & D (continuous measurements during the process are not possible).
- Shipment content: IN sensor, indicator, heating band, nozzle adapter, magnetic adapter, magnetic base and carrying case.
- Various nozzle adapters are available.
- Interchangeable nozzle adapters.

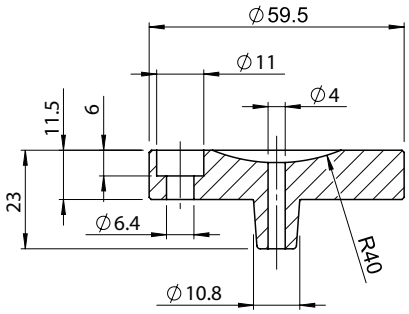
1.3.1. Dimensions

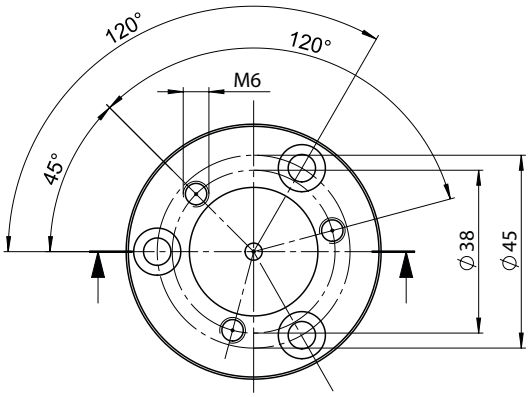


Dimensions in mm

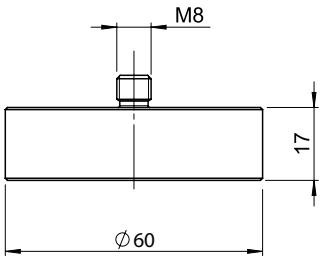
1.4. Assessories

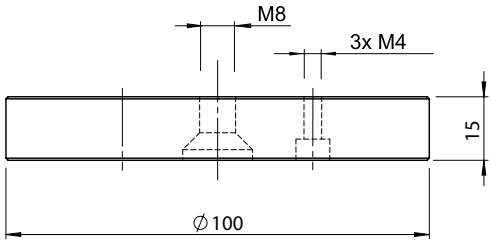
Nozzle adapter



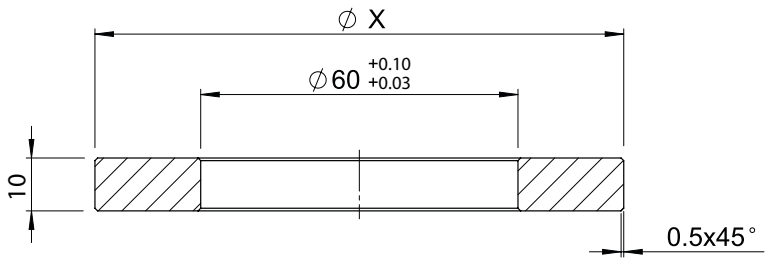


Magnetic base





Centering disc set



The set (F086992) contains	
	Ø X -0.05 / -0.15
1 piece	80
1 piece	90
1 piece	100

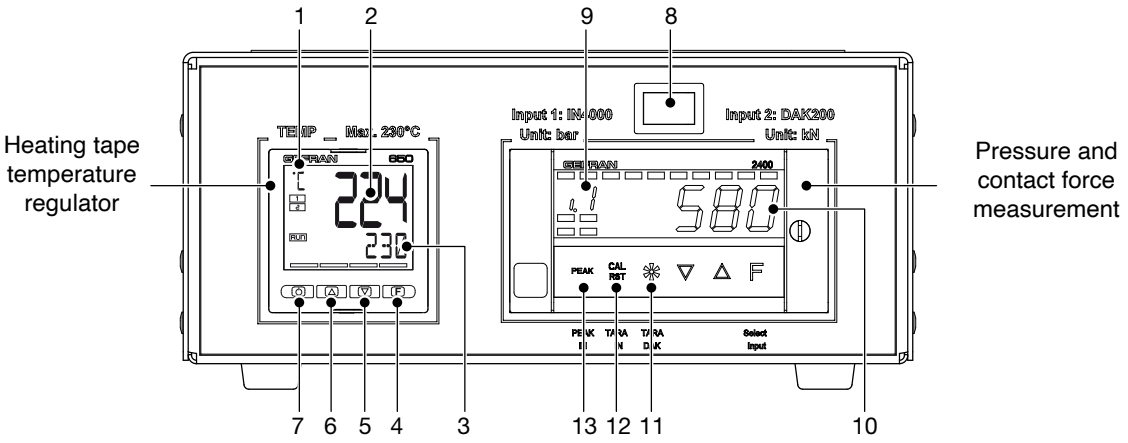
Dimensions in mm

1.5. Indicator

Main features

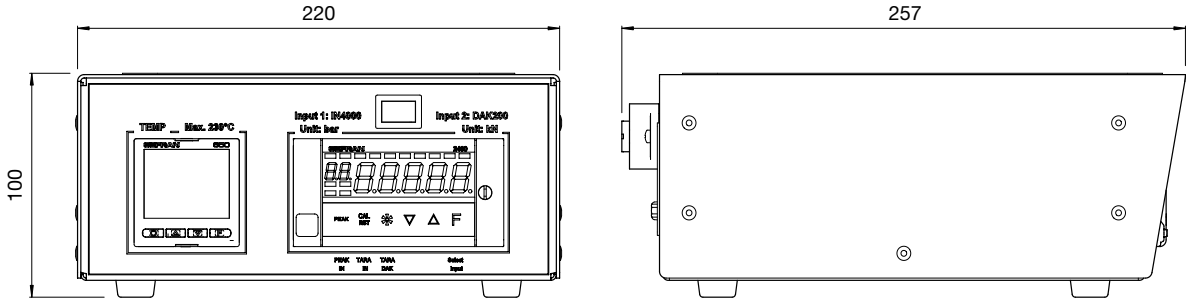
- Adjusting the heating tape temperature.
- Injection nozzle pressure measurement.
- Nozzle contact force measurement.
- Power supply for IN Sensor, heating tape, DAK sensor.
- RS232 output for serial communication between the indicator and a PC.

1.5.1. Interface



1. Temperature unit of measure
2. Measured heating tape temperature
3. Set heating tape temperature
4. Switching off heat
5. Down key: decreases the set temperature value
6. Up key: Increases the set temperature value
7. Not used
8. Pressure/contact force measurement selector
9. Indication of the displayed measurement
10. Measured pressure/contact force
11. DAK sensor output reset
12. IN Sensor output and peak value reset
13. Activating the IN maximum peak

1.5.2. Dimensions



Dimensions in mm

2. INSTALLATION

Warning! The installation of the devices described in the manual must be carried out by qualified personnel, following the laws and regulations and in accordance with the instructions contained in this manual.

Warning! Do not open the device when the power is on.

Warning! Use extreme caution when installing and fixing the sensor unit.
If the sensor unit is installed at a height of more than 1.8 meters, all persons near the moulding machine must wear the protective helmet.

Warning! During use, devices can reach high temperatures. Safety gloves are mandatory.

Before proceeding with the installation, check that the sensor, indicator and heating tape are intact and have not been damaged during transport. Also make sure that the package contains all accessories listed in the documentation.

Warning! If even one of the above-mentioned requirements is not met, suspend installation and contact your Gefran dealer or Gefran Customer Service.

2.1. Changing the nozzle adapter

The package includes a NA-IN-2 nozzle adapter.
The adapter has a hole diameter of 3 mm and serves to protect the IN Sensor from the injection nozzle.

The customer can modify the adapter by turning or milling to best match the injection moulding machine nozzle tip.
If you need to check injection moulding machines with different shaped nozzles, you can order additional nozzle adapters and modify them according to your needs.

2.2. Assembly

2.2.1. General installation rules

The sensor is designed for temporary installations between the mould and the injection nozzle.

Protection against dust
The sensor offers an IP65 degree of protection. It is therefore possible to install the device in dusty environments without any problems.

Necessary tools:
5 mm hexagonal male key.

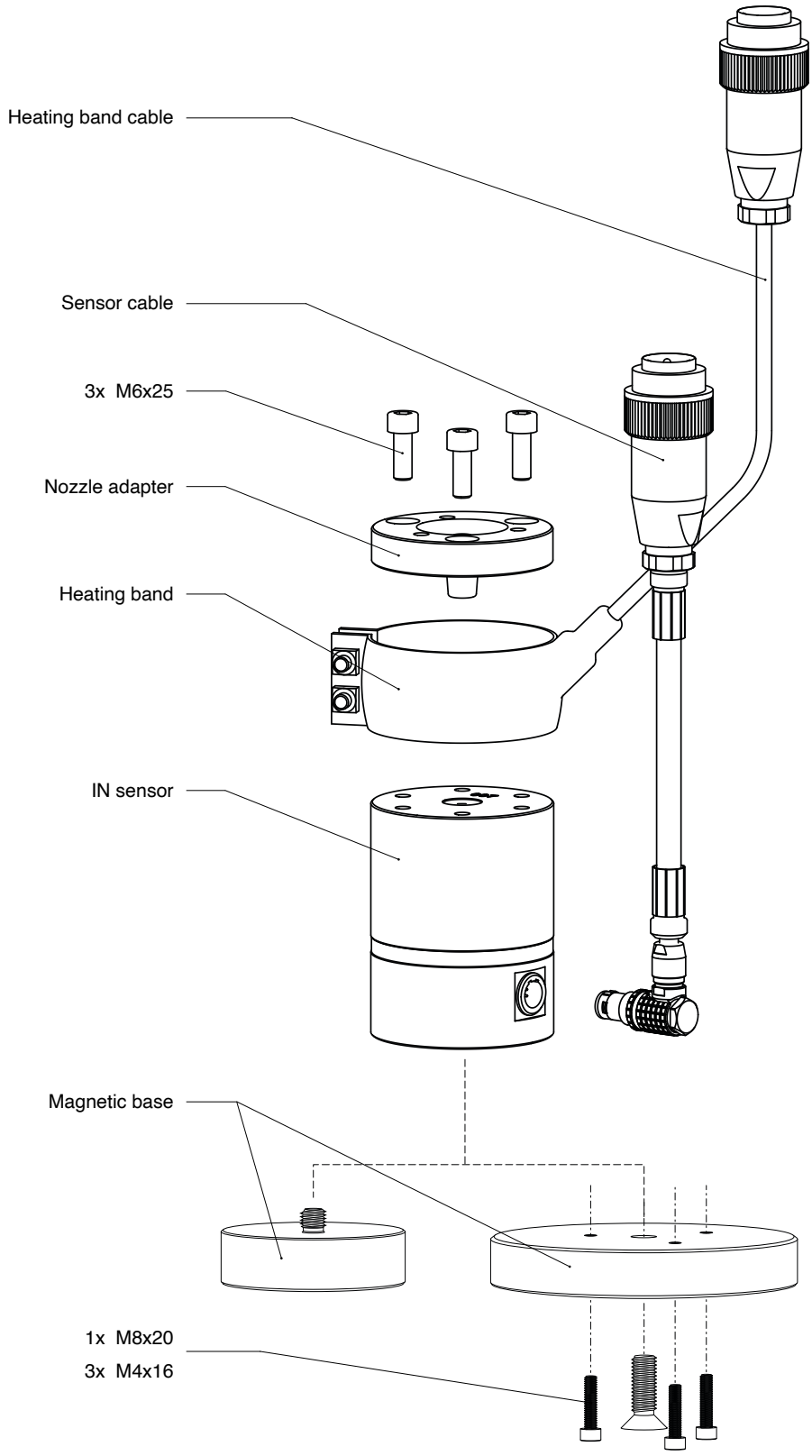
2.2.2. Assembly

The sensor components must be assembled together before use, depending on the moulding machine and the measurements that you want to take.
The following exploded drawings show the various assembly combinations. The individual components are screwed together or secured by screws.

In combination with the IN Sensor, the following components are used:

- Nozzle adapter: it is used to protect the IN sensor during use.
- Heating tape: it is threaded and tightened on the IN Sensor and serves to keep the melt liquid in case of multi-shot measurements.
- Thermal insulation disc: it is used to thermally isolate the sensor from the rest of the machine, ensuring uniform temperature to the sensor.
- Magnetic base adapter: locks the thermal insulation disc and allows the magnetic base to be connected.
- Magnetic base diameter 60 mm: used when the nozzle diameter in the mould or casting channel bushing is ≥ 60 mm.
- Magnetic base diameter 100 mm: used when the nozzle diameter in the mould or casting channel bushing is ≥ 100 mm. The three magnets hold the sensor firmly in place.
- DAK sensor: used to measure the nozzle contact force.

Example:
Assembly drawing



2.3. Connections

Warning! Please remember that failing to follow the instructions below could lead to electrical safety and electromagnetic compatibility problems, as well as void the warranty.

2.3.1. General rules for connections

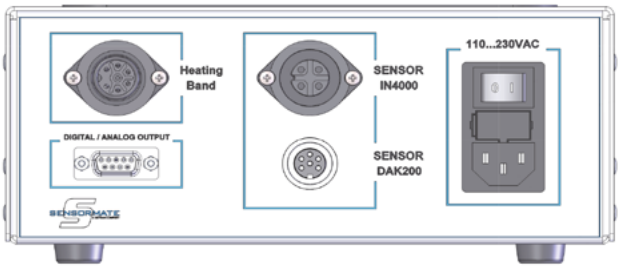
1. All connections must be made with the indicator turned off.
2. The externally connected circuits must have double insulation.
3. Use the twisted and shielded cables for digital output connections. The shield must be grounded at one point (indicator side). Do not connect the unused contacts.
4. Never connect IN Sensor, DAK sensor, and heating tape if their connectors or connecting cables are damaged.
5. Make sure that the grounding connection is efficient. A missing or ineffective ground connection can cause unstable device operations due to excessive environmental disturbances.
6. To avoid disturbances, the sensor cables must be kept away from the power cables (high voltage or large current).

2.3.2. Sensor connections

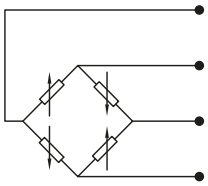
Make sure the indicator is off.
Connect the IN Sensor to the socket on the back of the indicator, screwing the connector to lock it.

Connect the DAK sensor and the heating tape, if applicable, to the appropriate indicator jacks, screwing the connectors to lock them.
Connect any other equipment to the digital output.

Indicator - Inputs

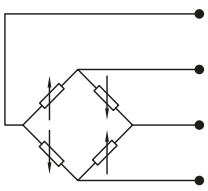


Input IN Sensor



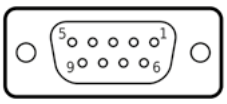
Pin	Function
2	Signal +
1	Excitation +
3	Signal -
4	Excitation -

Input DAK sensor



Pin	Function
4	Signal +
1-2	Excitation +
5	Signal -
3-6	Excitation -

Digital output



Pin	Function
1	-
2	RX
3	TX
4	-
5	GND
6	-
7	-
8	-
9	-

3. OPERATIONS

3.1. Measurement procedure

The injection pressure measurement procedure, or the nozzle contact force, is as follows:

1. Application of the sensor to the moulding machine.
2. Switching on the indicator.
3. Selecting the measurement type: injection pressure or nozzle contact force.
4. Reset.
5. Measurement.
6. Sensor cleaning.
7. Switching off the indicator.
8. Sensor removal.

Multiple measurements can be made by repeating steps 5 and 6 after removing the plastic injected.

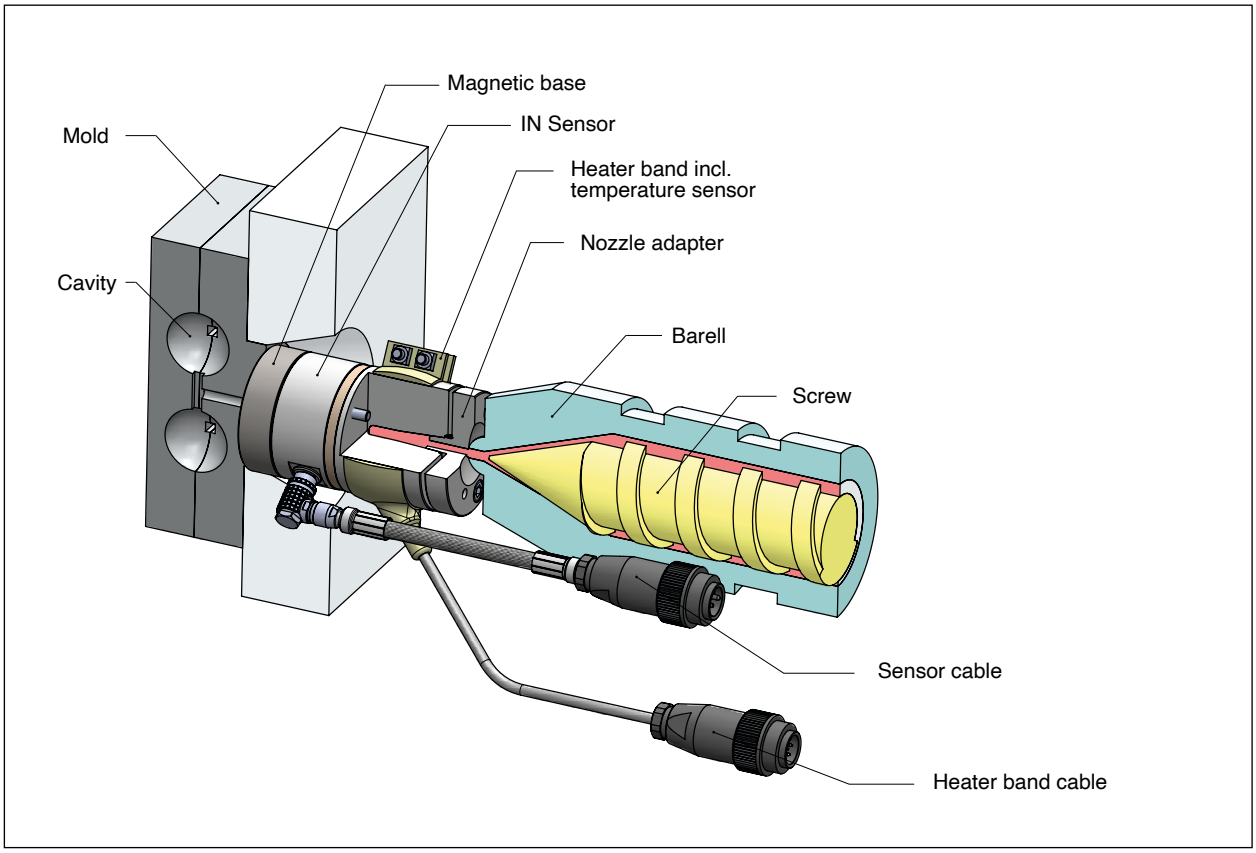
3.2. Application of the sensor to the moulding machine

Before applying the sensor to the machine make sure that:

- the magnetic base is suitable to the diameter of the nozzle fitting;
- the sensor assembly is suitable for the measurements you want to take.

To apply the sensor to the machine and prepare for the measurement:

1. Near the sensor to the moulding machine.
   The sensor will be held in position by the magnetic base.
2. Slowly approach the nozzle to the sensor, verifying that it is aligned with its centre. Adjust the sensor position if necessary.
3. Bring the nozzle in contact with the sensor.
   The illustration shows how the sensor is positioned in the moulding machine.



3.3. Start up

Turn on the indicator. The instruments are fully operational a few seconds after the indicator lights up.

It takes about 60 minutes for the tape to bring the inside of the sensor to 230° C.
For single shot measurements, or for multi-shot measurements with lower melt temperature, you cannot wait until the inside of the sensor has reached 230° C before proceeding with the measurements.

3.4. Selecting the measurement type

To select the measurement to be displayed, use the selector on the left tool.
If you choose 1, the injection pressure is displayed in bar. If you choose 2, the nozzle contact force, expressed in kN, is displayed.

Selecting the measurement type on the instrument display at the top left shows a 1 or 2 to indicate how the displayed numeric value is to be interpreted.

3.5. Reset

Before proceeding with the measurements, the sensors must be reset.

3.5.1. Resetting the DAK sensor

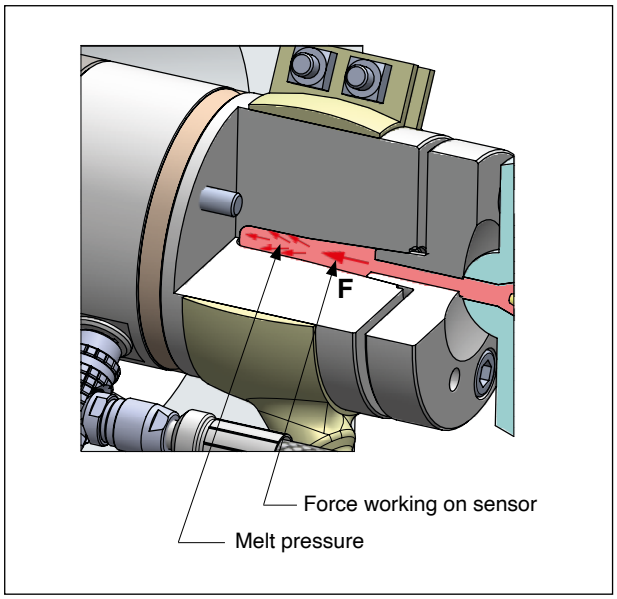
Before resting the nozzle against the sensor and taking the measurement, press the „TARA DAK“ button on the 2400 indicator to reset the measured value.

3.5.2. Resetting the IN Sensor

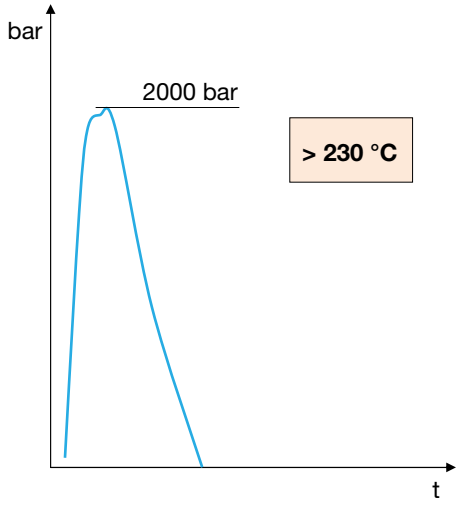
Press the nozzle against the sensor with the standard load while measuring is in progress.
Press the „TARA IN“ button on the 2400 indicator to reset the measured value before taking the measurement.

3.6. Measuring

To measure, a small amount of plastic is injected, which transmits the pressure to the measuring element.



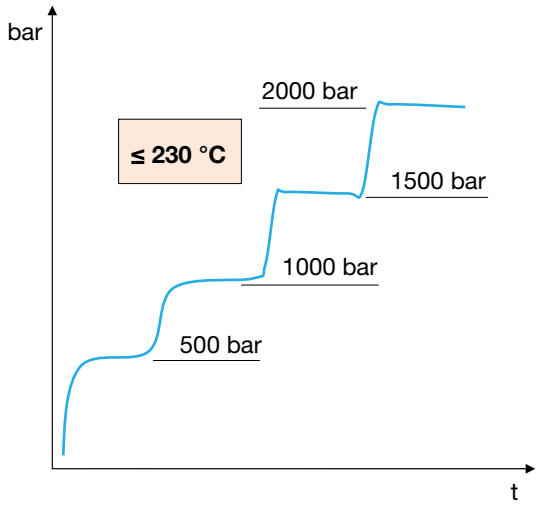
3.6.1. Single-shot measurement



Single-shot measurement is suitable for melt temperatures > 230°C and up to 400°C. A single pressure measurement is taken. Plastic solidifies and must be removed after each shot.

Inject as usual. The conical cavity in the nozzle adapter is filled with plastic and at the same time the injection nozzle pressure is measured, which is displayed in real time on the display.
In PEAK mode, you can also read smaller pressure peaks.

3.6.2. Multi-shot measurement



Multi-shot measurement is suitable for melt temperatures ≤ 230°C and pressures up to 4000 bar.
The plastic does not solidify during the pressure steps because it is kept liquid by the heating tape.
Increasing pressure steps are optional.
Inject as usual with the starting pressure (the lowest).
The conical cavity in the nozzle adapter is filled with plastic and at the same time the injection nozzle pressure is measured, which is displayed in real time on the display.
In PEAK mode, you can also read smaller pressure peaks.

3.6.3. Contact force measurement

If using the DAK sensor, you can check the nozzle contact force during injection.
The force may decrease due to the opposite thrust exerted by the melt being injected.

3.7. Sensor cleaning

Before taking a new measurement, release the pressure and load, retract the nozzle and remove the small plastic injected volume from the adapter and the sensor.
We recommend removing the sensor before cleaning it.

3.8. Sensor removal

To remove the sensor, tilt it slightly, to diminish magnetic attraction strength.

We recommend the sensor be switched off and wait for any heating tape to cool down before removing the sensor, or remove it using special gloves to avoid burning.

4. TECHNICAL SPECIFICATIONS

4.1. IN Sensor

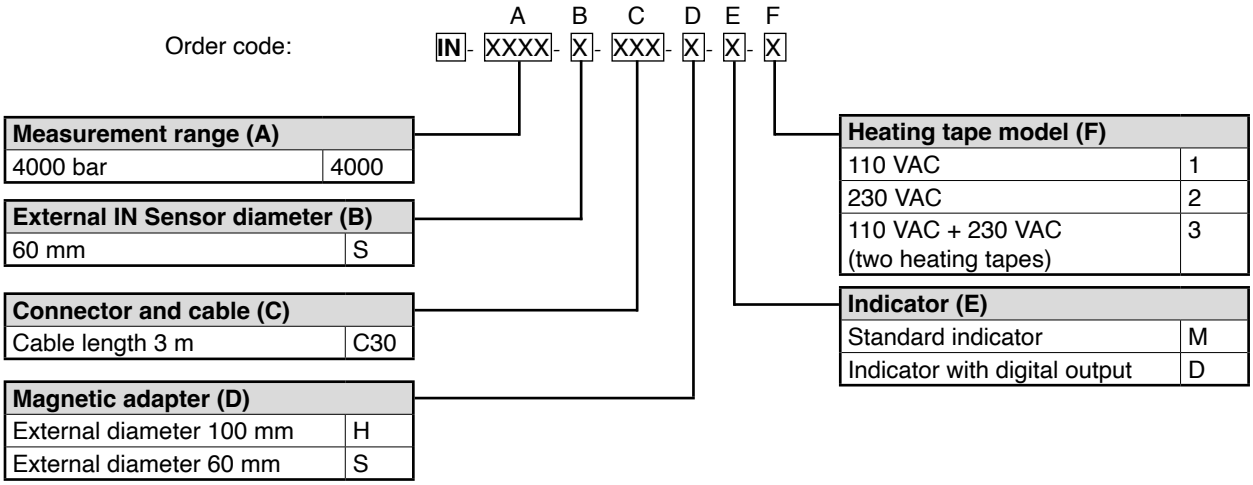
SENSOR		
	Strain gauge type	Foil
	Maximum touch force	300 kN (@ 60 mm diameter)
MEASUREMENT	Measurement range	4000 bar
	Sensitivity	1.5 mV/V (nominal)
	Accuracy error	< ± 0.5% FS
	Linearity error	< 0.2% FS
	Repeatability error	< 0.2% FS
GENERAL DATA		
CONNECTIONS	Connector	4-pin male connector Binder 99-4221-14-04
	Connection cable	Double-sheathed four-pole cable, with additional flexible outer protective steel sheath Length 3 m
ENVIRONMENTAL CONDITIONS	Use	Indoors
	Operating temperature	10...+230 °C (bis 400 °C with single-shot applications)
	Storage temperature	-20...+70 °C
PROTECTION RATING		IP50
ASSEMBLY	Positioning	Between mould and injection nozzle
	Mount	By magnet
CASE	Material	Stainless steel (high quality)
	Dimensions (D x H)	60 × 72 mm (excluding adapters, magnet and connection cable fitting)
WEIGHT		1.5 kg
EC REGULATIONS	EMC compatibility (electro-magnetic compatibility)	2014/30/EU Directive

4.2. Indicator

INSTRUMENTS		
CONTROL HEATING TAPE	Controller model	Gefran 650
	Control interval	0...230 °C
MEASUREMENT PRESSURE / CONTACT FORCE (with optional DAK sensor)	Meter Model	Gefran 2400
	Pressure/force selection	By front switch
	Measurement range	Pressure: -4000...+4000 bar Contact force: -200...+200 kN
	Functions	Peak storage
GENERAL DATA		
VOLTAGE	Operating voltage	110...230 VAC
	Current absorption	2.1 A max @ 230 VAC, 4.3 A max @ 110 VAC
	Dissipated power	2.5 W max.
	Protections	2.5 A delayed fuse for 230 VAC, 5 A for 110 VAC
	Connection	IEC male panel connector
CONNECTIONS	IN Sensor	Sensor Connector: 4-pole panel socket
	Heating tape	Sensor Connector: 7-pole panel socket
	DAK Sensor	Sensor Connector: 6-pole panel socket
	Digital output	Connector: DB-15 (connector shared with power connection)
ENVIRONMENTAL CONDITIONS	Use	Indoors
	Operating temperature	0...+50 °C
	Storage temperature	-20...+70 °C
PROTECTION RATING		IP40
ASSEMBLY	Positioning	Free
	Mount	By screws
CASE	Material	Stainless steel
	Dimensions (L x H x P)	220 × 100 x 257 mm
WEIGHT		2.7 kg
EC REGULATIONS	EMC compatibility (electro-magnetic compatibility)	2014/30/EU Directive
	LVD safety	2014/35/EU Directive

5. ORDER CODES

5.1. IN Sensor



Example

IN-4000-S-C30-S-M-2 Nozzle pressure sensor with 4000 bar measurement range, magnetic adapter with external diameter 60 mm, cable length 3 m, standard indicator and heating tape for 230 VAC voltage.

5.2. Accessories

F code	Order code	Description
F086990	NA-IN-3	Nozzle adapter type NA-IN-3
F063416	IN-0000-O-000-O-M-O	Standard indicator
F069660	IN-0000-O-000-O-D-O	Indicator with digital output
F068444	IN-0000-O-000-S-O-O	60 mm magnetic base
F069015	IN-0000-O-000-H-O-O	100 mm magnetic base
F086992	CD-IN-080-090-100	Centering disc set
F065947	IN-0000-O-000-O-O-1	110 VAC heating tape
F062424	IN-0000-O-000-O-O-2	230 VAC heating tape
F069659	IN-0000-O-000-O-O-3	110 VAC and 230 VAC heating tapes

Notes:

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