RJG MOLD SMART

# PRODUCT MANUAL

## LYNX™ SHIELDED ANALOG INPUT MODULE

## IA1-M-V


*Training and Technology for Injection Molding*

PRINT DATE 04.06.2026
REVISION NO. 1

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## IA1-M-V

# INTRODUCTION

Read, understand, and comply with all following instructions. This guide must be kept available for reference at all times.

## DISCLAIMER

Inasmuch as RJG, Inc. has no control over the use to which others may put this material, it does not guarantee that the same results as those described herein will be obtained. Nor does RJG, Inc. guarantee the effectiveness or safety of any possible or suggested design for articles of manufacture as illustrated herein by any photographs, technical drawings, and the like. Each user of the material or design or both should make his own tests to determine the suitability of the material or any material for the design as well as the suitability of the material, process, and/or design for his own particular use. Statements concerning possible or suggested uses of the material or designs described herein are not to be construed as constituting a license under any RJG, Inc. patent covering such use or as recommendations for use of such material or designs in the infringement of any patent.

## PRIVACY



## ALERTS

The following three alert types are used as needed to further clarify or highlight information presented in the manual:

**DEFINITION** *A definition of a term or terms used in the text.*

**NOTES** *A note provides additional information about a discussion topic.*

**CAUTION** *A caution is used to make the operator aware of conditions that can cause damage to equipment and/or injury to personnel.*

# NOTES

## PRODUCT DESCRIPTION

The Lynx™ shielded analog input module IA1-M-V is a DIN-rail-mounted module that is wired to the molding machine in order to collect 0–10 V DC signals from analog measurement devices, providing information such as injection pressure, plastic pressure, screw position, and temperature.

## APPLICATIONS

### PROCESS MONITORING AND CONTROL

The IA1-M-V gathers 0–10 V signals from molding machine analog inputs for the eDART or CoPilot systems. The eDART or CoPilot system performs computations using the 0–10 V DC signals from the injection molding machine or other measurement devices for various process parameters during a typical cycle.

### OPERATION

The IA1-M-V supplies the eDART or CoPilot system with injection pressure, stroke position/velocity, or dew point signals from the machine's output card.

In addition, the IA1-M-V is compatible with other measurement devices that supply a 0–10 V signal for process monitoring, including: air flow, barrel temperature, coolant flow rate, coolant pressure, coolant temperature, delta pressure, dryer temperature, ejector pin (indirect) pressure, hydraulic pressure, line temperature, melt pressure, mold deflection, mold temperature, power consumption, revolution rate, and vacuum.

### INJECTION PRESSURE

The IA1-M-V is often used to acquire an injection pressure signal from electric injection molding machines. The shielded analog input module cable C-IA1-M-3M is wired to the machine output card which provides the signal; the C-IA1-M-3M is connected to the IA1-M-V, which collects the signal for use with the eDART or CoPilot system. In the eDART or CoPilot system software, the module is configured to read the voltages as pressures.

### SCREW POSITION/VELOCITY

The IA1-M-V is often used to acquire an screw position/velocity signal from electric injection molding machines. The shielded analog input module cable C-IA1-M-3M is wired to the machine output card which provides the signal; the C-IA1-M-3M is connected to the IA1-M-V, which collects the signal for use with the eDART or CoPilot system. In the eDART or CoPilot system software, the module is configured to read the voltages as position/velocity.

### DEW POINT

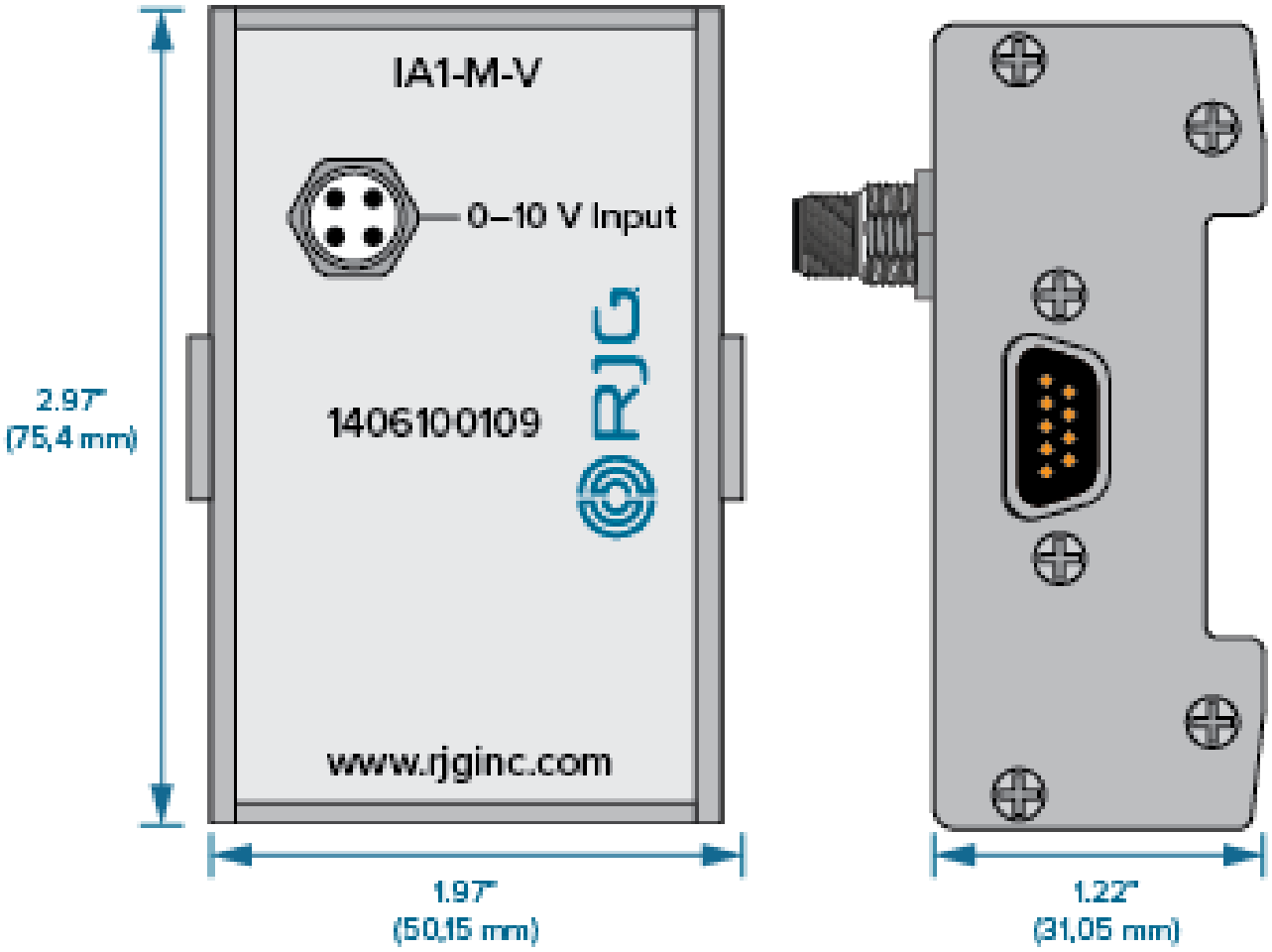
The IA1-M-V can be used to acquire a dew point measurement from the Vaisala DRYCAP® Transmitters DMT142 or DMT143. The DMT142 or DMT143 is connected to the IA1-M-V using a cable (included with DMT142 or DMT143 purchase from RJG), which collects the signal for use with the eDART. In the eDART software, the module is configured to read the voltages as dew point.

## OTHER SUPPORTED SENSOR TYPES

The IA1-M-V also supports the additional following sensor types:

- Ejector Pin (indirect)
- Hydraulic Pressure
- Mold Temperature
- Barrel Temperature
- Coolant Temperature
- Coolant Flow Rate
- Delta Pressure
- Revolution Rate
- Mold Deflection
- Power Used
- Dryer Temperature
- Air Flow
- Melt Pressure
- Line Temperature
- Vacuum

## DIMENSIONS




## CABLE LENGTH

The C-IA1-M-3M is 9.8 ft. (3 m) long.

CABLE LENGTH

# NOTES

# INSTALLATION

## INSTALLATION OVERVIEW

The shielded analog input module is mounted to a solid surface, such as the machine frame, inside the molding machine on a DIN rail.

### IA1-M-V

The shielded analog input module cable C-IA1-M-3M is wired directly to the machine (to an output card) on one end—or to some other 0–10 V measurement device—and connected to the IA1-M-V on the other using the four-pin connector. The shielded analog input module is connected to the ID7-M-SEQ (or DIN/LX-D) using the integrated amphenol connector.


### eDART OR COPILOT SYSTEM CONNECTION

A Lynx premium cable CE-LX5-W is connected to the Lynx port on the ID7-M-SEQ and a Lynx port on the eDART or CoPilot system to provide it with the machine's sequence signals for process monitoring and control calculations, along with the other installed machine interface module signals.

## INSTALLATION SPECIFICATIONS

The instructions that follow are a general guide; actual steps necessary to install this product will vary based on injection molding machine manufacturer, model, and options.

The required machine signals can often be obtained from the machine's output card.

## REQUIREMENTS

**CAUTION** *Before beginning IA1-M-V installation, disconnect and lockout/tag-out any and all power to the molding machine. Failure to comply will result in personal injury or death, and damage or destruction of equipment.*

## MOUNTING

Mount the IA1-M-V module to a solid surface—such as the molding machine frame—using the supplied 1.38" (35 mm) DIN rail. A clearance height of 6" (152,4 mm) from the face of the module is recommended.

**NOTES** *Modules and connecting cables must be located away from any static sources, such as feeder tubes and material hoppers.*

## WIRING

The C-IA1-M-3M cable has colored-coded wires to simplify installation. Refer to the table below for the correct wire/signal combinations for installation.

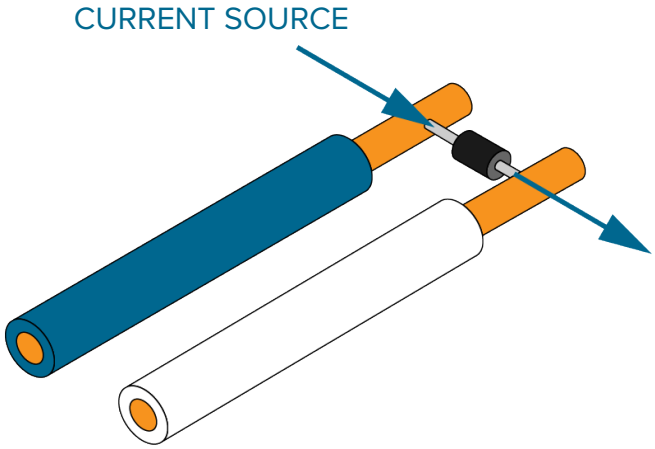
| INPUT | FUNCTION | COLOR |
|---|---|---|
| 0–10 V | + Signal | Blue |
| 0 V DC Common | – Signal | White |

Attach the 0 V DC (white) wire to the common terminal of the injection molding machine 0–10 V DC I/O card.

Attach the 0–10 V DC (blue) wire to the output terminal of the injection molding machine 0–10 V DC I/O card.

If a 4–20 mA sensor is used, a 500 Ω resistor can be used to appropriately alter the signal to work with the 0–10 V IA1-M-V (below). Wire the resistor between the C-IA1-M-3M cable pigtals at the machine output card, as shown below.

**NOTES** *Note the signals which are wired to the machine for future software setup and use.*




## CONNECTIONS

Connect the C-IA1-M-3M cable to the IA1-M-V module.

Connect the IA1-M-V to the shielded sequence module ID7-M-SEQ—or shielded communications module DIN/LX-D—using the integrated, side-mount amphenol connector.

## eDART SOFTWARE SETUP

Each sensor type must be fully-defined in the software for the IA1-M-V and eDART to provide accurate data. Always read and perform the following instructions to set up the IA1-M-V module in the eDART software.

## eDART VERSION 9.XX

1. Select the Sensor Type “0 - 10V Input” in Sensor Locations and Scaling.
2. With the motor or machine (depending on the sensor type) off/in standby, measure and record the voltage—the voltage should be displayed in the “Value” column.
3. Measure and record the actual voltage at maximum—the voltage should be displayed in the “Value” column. Record the machine value for the measurement at this time, as well.
   For example, if using the IA1-M-V to acquire injection pressure from the machine, record the machine’s injection pressure displayed on the controller.
4. Subtract the low voltage value recorded in step 2 from the high voltage value recorded in step 3.
5. Select the Setup button in Sensor Locations and Scaling.
6. Select the sensor model number from the drop-down menu; if not listed choose “Other”.
7. Select the sensor type from the drop-down menu.
8. Enter the machine value recorded in step 3 into the Sensor Full Scale field, and select the appropriate units of measurement.
9. Enter the change in voltage found in step 4 in the “when signal shifts by” field.
10. Select Accept to save the entered information.

## eDART VERSION 10.XX

1. Drag and drop the input from the Available Sensor list in Machine Setup/ INPUTs to the desired position.
2. Click the “i” on the analog input to open the Analog Input Scaling window.
3. With the motor or machine (depending on the sensor type) off/in standby, measure and record the voltage.
4. Measure and record the actual voltage at maximum; record the machine value for the measurement at this time, as well.

For example, if using the IA1-M-V to acquire injection pressure from the machine, record the machine’s injection pressure displayed on the controller.

5. Enter the machine value recorded in step 4 into the Maximum field, and select the appropriate units of measurement.
6. Enter the maximum voltage recorded in step 4 into the Voltage at Maximum Pressure field.
7. Enter the voltage recorded in step 3 into the Voltage at 0 field.
8. Select Save to save the entered information.

## COPILOT SYSTEM

Refer to the CoPilot System Software User Guide—available for download online at www.rjginc.com—to set up the IA1-M-V module in the CoPilot system software.

## MATH EQUATIONS FOR ANALOG INPUTS

Alternately, the following math equations may be used to determine injection pressure, screw position, and velocity maximum voltages if voltages for hold pressure, position shot size, or velocity setting are known:

### 1. Injection Pressure

$$\frac{\text{Volts}}{\text{Hold Pressure Setting}} \times \text{MAX Pressure} = \text{Volts at MAX Pressure}$$

### 2. Screw Position

$$\frac{\text{Volts}}{\text{Position Shot Size}} + \left(\text{Decomp} \times \text{MAX Pressure}\right) = \text{Volts at MAX Position}$$

### 3. Velocity

$$\frac{\text{Volts}}{\text{Velocity Setting}} \times \text{MAX Velocity} = \text{Volts at MAX Velocity}$$

# MAINTENANCE

The shielded analog input module requires little to no maintenance provided that all installation instructions are followed.

## CLEANING

### REGULAR CLEANING

Cables must be installed in areas free from oil, dirt, grime, and grease.

RJG, Inc. recommends the following cleaners:

- Microcare MCC-CCC Contact Cleaner C
- Microcare MCC-SPR SuprClean™
- Miller-Stephenson MS-730L Contact Re-Nu®

## WARRANTY

### RJG, INC. STANDARD WARRANTY

RJG, Inc. is confident in the quality and robustness of the shielded analog input module, and so are offering a one-year warranty. RJG's products are guaranteed against defects in material and workmanship for one year from the original date of purchase. The warranty is void if it is determined that the adapter was subjected to abuse or neglect beyond the normal wear and tear of field use, or in the event the adapter box has been opened by the customer.

## PRODUCT DISCLAIMER

RJG, Inc. is not responsible for the improper installation of this equipment, or any other equipment RJG manufactures.

Proper RJG equipment installation does not interfere with original equipment safety features of the machine. Safety mechanisms on all machines should never be removed.

# NOTES

## TROUBLESHOOTING

### COMMON INSTALLATION ERRORS

### NEGATIVE SCALING FOR STROKE

Problem: Negative value was entered in stroke scaling.

Solution: The analog input module cannot see negative voltages. The wiring must have the positive (+) terminal on the analog input above the negative (-) terminal.

The eDART determines the stroke direction using the Screw Run signal. It will invert the signal automatically if necessary to get a positive volume and stroke curves, and to analyze flow of material.

If there is no machine sequence module input for Screw Run positive numbers for full scale must still be used; set the screw direction correctly in “Sequence Settings”. The stroke signal should ascend positively while the material is being injected into the mold; the zero of the screw (screw bottom) must also be set.

### FALSE CYCLE START ON PRESS POWER-UP

Problem: Job on eDART is started before machine is powered on.

Solution: Always power the eDART on after the machine is powered on.

Analog signals tend have a spike or a sudden “lurch” from zero to a specific position voltage. Often the eDART will interpret the forward jump of the stroke signal as the cycle start. Sumitomo machines are particularly prone to this false trigger problem because a calibration cycle is performed at each power-up.

### INCORRECT INJECTION PRESSURE SCALING

Problem: Injection pressure scaling is incorrect.

Solution: The eDART system and Lynx sensors eliminate the need for the manual scaling steps if injection pressure (for electric machines) comes from either a nozzle pressure sensor or an electrical signal from the machine. However, if signals from another source are used, then scaling must be manual input in the eDART.

The electrical signal for pressure is usually 0–10 V ,with a “low” voltage (not always zero) being no pressure and a “high” voltage (not always 10 V) being the highest pressure. Compare the machines reported hold pressure to the eDART-reported pressure to determine whether a scaling adjustment is necessary.

## CUSTOMER SUPPORT

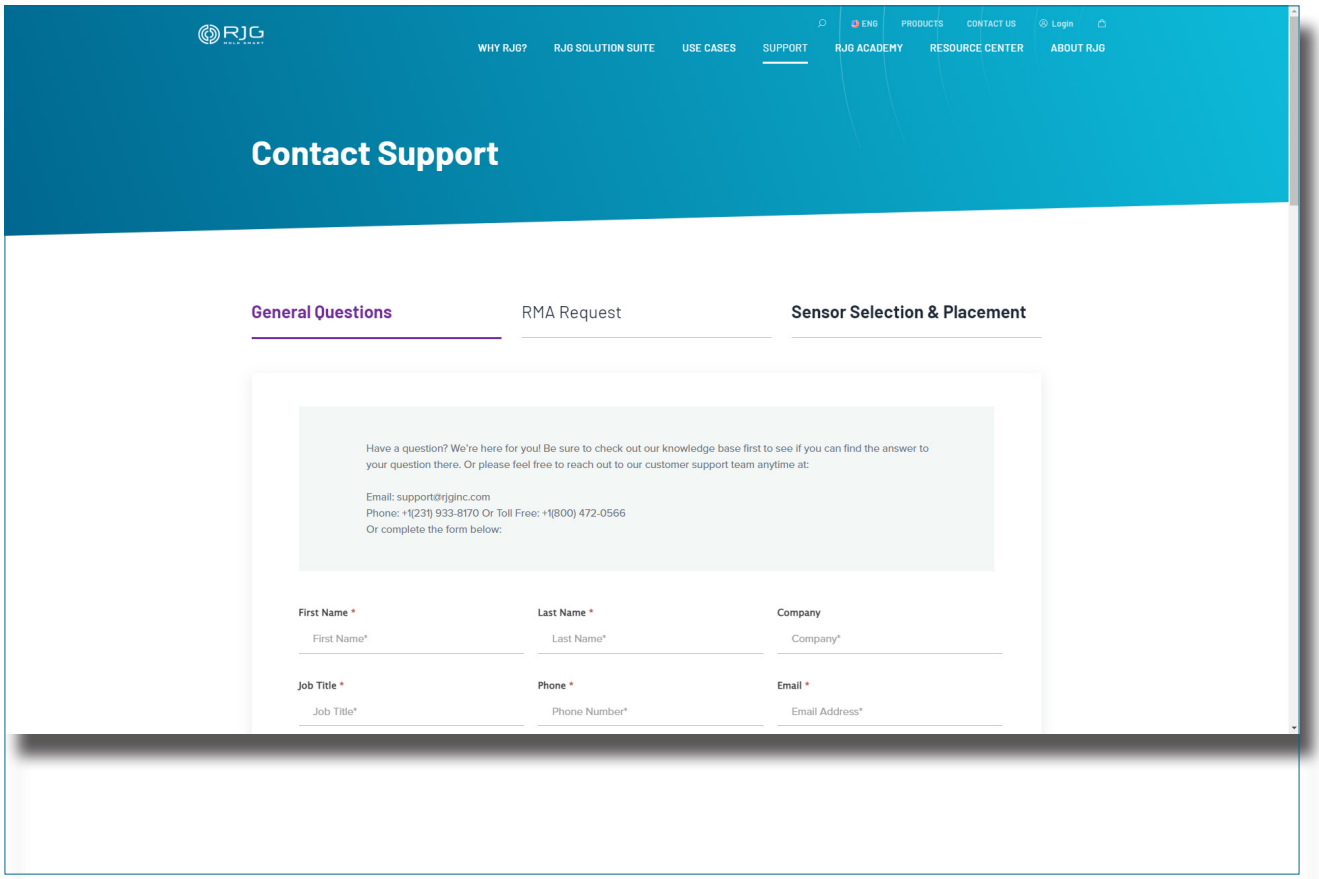
Contact RJG's Customer Support team by phone or email.

RJG, Inc. Customer Support

P: 800.472.0566 (Toll Free)

P: +1.231.933.8170

www.rjginc.com/support



## RELATED PRODUCTS

The shielded analog input module is compatible with other RJG, Inc. products for use with the eDART process control and monitoring system.

### COMPATIBLE PRODUCTS

### SHIELDED ANALOG INPUT MODULE CABLE C-IA1-M-3M

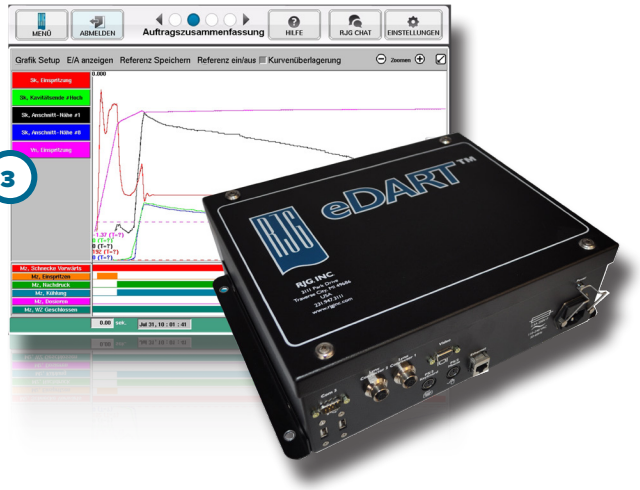
The shielded analog input module cable C-IA1-M-3M (1 at right) cable features a metal sheathing and shielding suited for the heat and stress found in injection molding environments. Designed specifically for use with RJG, Inc.'s analog input module IA1-M-V and the eDART or CoPilot system, the C-IA1-M-3M provides a connection from molding machines' output card and the RJG, Inc. C-IA1-M-3M.

### LYNX SHIELDED SEQUENCE MODULE ID7-M-SEQ

The Lynx shielded sequence module ID7-M-SEQ (2 at right) is a DIN-rail-mounted module that is wired to the molding machine in order to collect 24 V DC timing signals for use with the eDART or CoPIlot system, including injection forward, screw run, mold closed, first stage, and mold opening.


### EDART PROCESS CONTROLLER

The eDART process controller (3 at right) is the base hardware unit for the eDART system. The eDART system is the most powerful process control system in the industry, allowing molders to stabilize and control injection molding processes and contain bad parts, ensuring high quality and cost-reduction.



## SIMILAR PRODUCTS

The following products, similar to the IA1-M-V, are compatible for use with the eDART process control and monitoring system.

## LYNX COMMUNICATIONS ADAPTER DIN/LX-D

The Lynx communications adapter DIN/LX-D (1 at right) is a shielded, DIN-rail-mounted module that interfaces other RJG, Inc. shielded machine interface modules with the eDART system when the ID7-M-SEQ is not used. This module is shielded to ensure high quality data even in rugged molding environments, and designed to be mounted on standard 35 mm DIN rails often found in machine panels.

## LYNX SHIELDED DUAL-RELAY OUTPUT MODULE OR2-M

The Lynx shielded dual-relay output module OR2-M (2 at right) is a shielded, DIN-rail-mounted module that interfaces the eDART and sorting equipment or injection molding machines to implement part containment or control transfer. This module is shielded to ensure high quality data even in rugged molding environments, and designed to be mounted on standard 35 mm DIN rails often found in machine panels.

## LYNX SURFACE-MOUNT ANALOG INPUT MODULE IA1-S-VI-24

The Lynx surface-mount analog input module IA1-S-VI-24 (3 at right) is a shielded, surface-mounted module that interfaces the eDART and injection molding machines in order to collect 0–10 V DC signals from analog measurement devices, providing information such as: injection pressure, plastic pressure, screw position, and temperature.

1


2


3

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