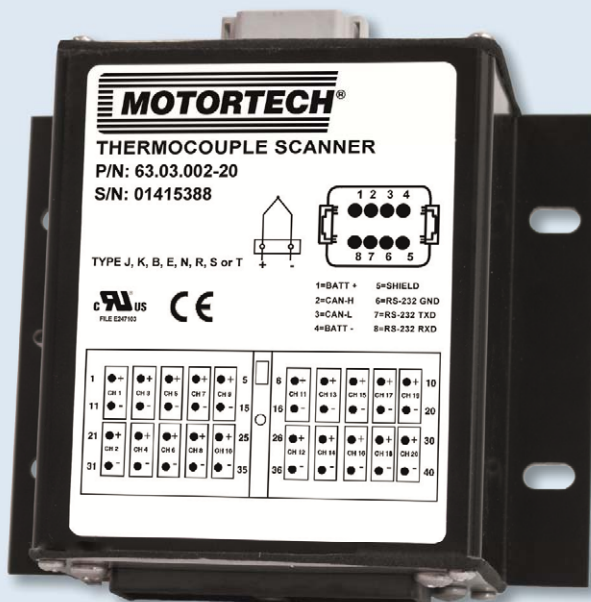


TEMPSCAN₂₀ – TEMPERATURE SCANNER

OPERATING MANUAL



TempScan20 
MOTORTECH TEMPERATURE SCANNER

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1 GENERAL INFORMATION

Read through this operating manual carefully before use and become familiar with the machine. Installation and start-up should not be carried out before reading and understanding this document. Keep this manual readily available so that you can reference it as needed.

1.1 What Is the Purpose of this Operating Manual?

This manual serves as an aid for the installation and operation of the product and supports the technical staff with all operating and maintenance tasks to be performed. Furthermore, this manual is aimed at preventing dangers to life and health of the user and third parties.

1.2 Who Is this Operating Manual Targeted to?

The operating manual provides a code of conduct for personnel tasked with the set-up, operation, maintenance, and repair of gas engines. A certain level of technical knowledge with respect to the operation of gas engines and basic knowledge of electronic ignition systems are necessary. Persons who are only authorized to operate the gas engine shall be trained by the operating company and shall be expressly instructed concerning potential hazards.

1.3 Which Symbols Are Used in the Operating Manual?

The following symbols are used in this manual and must be observed:



Example

This symbol indicates examples, which point out necessary handling steps and techniques. In addition, you receive additional information from the examples, which will increase your knowledge.



Notice

This symbol indicates important notices for the user. Follow these. In addition, this symbol is used for overviews that give you a summary of the necessary work steps.



Warning

This symbol indicates warnings for possible risks of property damage or risks to health. Read these warning notices carefully and take the mentioned precautionary measures.

1 GENERAL INFORMATION



Danger

This symbol indicates warnings for danger to life, especially due to high voltage. Read these warning notices carefully and take the mentioned precautionary measures.

2 INTENDED USE

2.1 Functional Description

The temperature scanner TempScan20 monitors up to 20 thermocouples of the types B, E, J, K, N, R, S and T. Warnings and error messages can be transmitted via the CAN bus if temperatures exceed or fail to reach the set limits. The device is configured and measured values processed via the HMI module PoweView3 from MOTORTECH.

2.2 Application Range

The temperature scanner TempScan20 monitors thermocouples of types B, E, J, K, N, R, S and T. The operation requires an HMI module PowerView3 MOTORTECH.

Any use other than the one described in the operating manual shall be considered improper use and will result in the voiding of all warranties.

3 SAFETY INSTRUCTIONS

3.1 General Safety Instructions

The following safety instructions must be followed in the area in which the device is operated:



High voltage! Danger to life!

While the engine is running, the area around the ignition system especially holds the risk of danger due to high voltage. The following parts should therefore not be touched or removed unless explicitly stated otherwise:

- Ignition coils and caps
- Wires of the high voltage circuit
- In- and output wiring of the ignition controller
- Pickups and their wiring



Danger to persons with pacemakers!

Electromagnetic impulses in the wiring of the ignition system may exceed the permissible limits of pacemakers. Persons with pacemakers must therefore not be present in the vicinity of the ignition system being operated. Mark the operating location of the ignition system with the corresponding standardized warning symbol.

MOTORTECH equipment is manufactured as state of the art and therefore safe and reliable to operate. Nevertheless the equipment can cause risks or damage can occur, if the following instructions are not complied with:

- The gas engine must only be operated by trained and authorized personnel.
- Operate the equipment only within the parameters specified in the technical data.
- Use the equipment correctly and for its intended use only.
- Never apply force.
- For all work such as installation, conversion, adaptation, maintenance, and repair, all equipment must be disconnected from the mains and secured against unintentional reactivation.
- Perform only such maintenance and repair work as is described in this operating manual, and follow the instructions given while working. For maintenance of the equipment, only use spare parts supplied by MOTORTECH. Further work must only be performed by personnel authorized by MOTORTECH. Non-compliance with the instructions will void any warranties for the proper function of the equipment as well as the responsibility for the validity of the certifications.
- Safety devices must not be dismantled or disabled.
- Avoid all activities that can impair the function of the equipment.

- Operate the equipment only while it is in proper condition.
- Investigate all changes detected while operating the gas engine or ignition system.
- Ensure compliance with all laws, directives and regulations applicable to the operation of your system, including such not expressly stated herein.
- If the system is not entirely tight and sealed, gas may escape and result in explosion hazard. Upon completion of all assembly works, always check the system's tightness.
- Always ensure adequate ventilation of the engine compartment.
- Ensure a safe position at the gas engine.

3.2 Special Safety Instructions for the Device



Explosion hazard!

Do not carry out any work on electrical connections when the circuit is live unless the area is known to be non-hazardous.

3.3 Electrostatic Discharge Hazards

Electronic equipment is sensitive to static electricity. To protect these components from damage caused by static electricity, special precautions must be taken to minimize or prevent electrostatic discharge.

Observe these safety precautions while you work with the equipment or in its vicinity.

- Before performing maintenance or repair work, ensure that the static electricity inherent to your body is discharged.
- Do not wear clothing made from synthetic materials to prevent static electricity from building up. Your clothing should therefore be made of cotton or cotton mix materials.
- Keep plastics such as vinyl and Styrofoam materials as far away from the control system, the modules, and the work environment as possible.
- Do not remove the circuit boards from the housing of the device.

3.4 Proper Disposal

After the expiration of its service life, MOTORTECH equipment can be disposed of with other commercial waste, or it may be returned to MOTORTECH. We will ensure its environmentally friendly disposal.

4 PRODUCT DESCRIPTION

4.1 Technical Data

4.1.1 Mechanical Data

The temperature scanner TempScan20 has the following mechanical characteristics:

| Feature | Value |
|-----------------------|--|
| Storage temperature | -50 °C to +120 °C (-58 °F to +248 °F) |
| Operating temperature | -40 °C to +85 °C (-40 °F to +158 °F) |
| Measuring range | -273 °C to +1735 °C (-459.4 °F to +3155 °F) |
| Measuring accuracy | ± 1 °C |
| Drift | max. 150 ppm/°C of the range |
| Relative humidity | max. 95 % (without condensation at +30 °C to +60 °C [+86 °F to +140 °F]) |
| Dimensions | 145.3 mm x 149 mm x 73 mm (5.72" x 5.86" x 2.87") |
| Weight | 1 kg (2.2 lbs) |
| Protection class | IP65 |

4.1.2 Electrical Data

The temperature scanner TempScan20 has the following electrical characteristics:

| Feature | Value |
|--------------------|--|
| Supply voltage | Nom. 12 or 24 V DC (182 mA at 12 V DC typical, 79 mA at 24 V DC typical) |
| Measuring speed | 100 ms per channel approx. 2.4 s. for a complete cycle of all 20 channels |
| Thermocouple types | B, E, J, K, N, R, S and T |
| CAN interface | CAN 2.0B isolated |

4.1.3 Warning Notices on the Device



Validity of the Warning Notices on the Device

The warning notices on the device are valid for the TempScan20 and all CSA-certified MOTORTECH components connected to it.

| English warning notice on the device | French warning notice on the device |
|---|---|
| Warning – Explosion Hazard – Substitution of components may impair suitability for Class 1, Division 2. | Avertissement – Risque d'explosion – La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe 1, Division 2. |
| Warning – Explosion Hazard – Do not disconnect while circuit is live unless area is known to be non-hazardous. | Avertissement – Risque d'explosion – Ne pas débrancher tant que le circuit es sous tension, à moins qu'il ne s'agisse d'un emplacement non dangereux. |

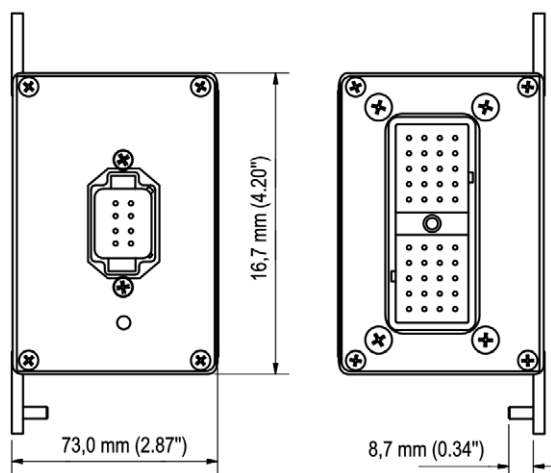
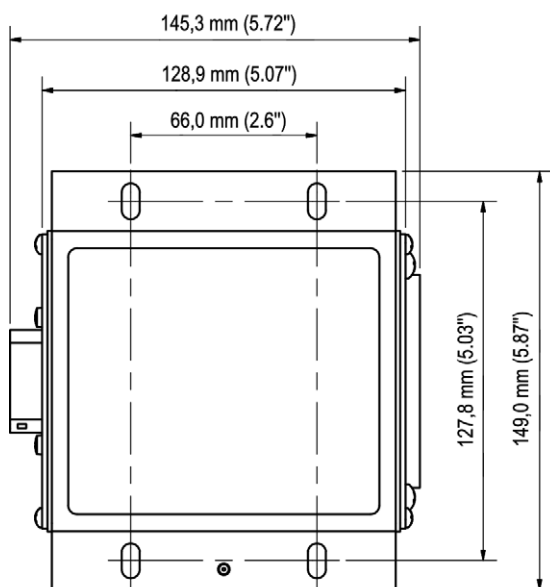
4.1.4 Product Identification – Labeling on the Device

On the back of the temperature scanner TempScan20 there is a sticker with the following information:

- P/N: Product number
- S/N: Serial number

4 PRODUCT DESCRIPTION

4.1.5 Overview Drawings



5 INSTALLATION INSTRUCTIONS

5.1 Unpacking the Equipment and Scope of Supply

Unpacking

Unpack the equipment, taking care not to damage it, and ensure that the operating manual is always stored with the equipment and is easily accessible. Check the contents for completeness and verify that the equipment meets your application requirements.

Scope of Supply

The scope of supply of the TempScan20 includes:

- TempScan20
- 48 contacts (for connector plug sets)
- 24 sealing plugs (for unused outputs of the connector plug sets)
- 120 Ω CAN terminating resistor
- Removal tool for contacts
- Connector plug set for power supply/CAN
- Connector plug set for thermocouples
- Wedge lock for connector plug set for power supply/CAN
- 2 protective caps for connector plug sets
- Operating Manual

5.2 Installation

The temperature scanner TempScan20 is suitable for mounting on the engine. Install the device as follows:



Risk of damage!

Strong electromagnetic fields can affect the TempScan20 or destroy it. Therefore, do not install the device in the vicinity of high voltage or high current devices.

1. Select a suitable place for the TempScan20. When selecting a location, bear in mind the following points:
 - The maximum length of the CAN bus is 120 m.
 - The maximum length of the thermocouple cables is 30 m.
 - The maximum length for the power supply cable is 10 m.
 - Install the device horizontally so that the connections exit laterally. This protects the device better against penetrating moisture.

5 INSTALLATION INSTRUCTIONS

- The TempScan20 and the wiring must be suitable for the ambient temperature (see section: *Mechanical Data* on page 10).
 - Make sure there is sufficient space to carry out maintenance work on the TempScan20, the wiring harness and for strain relief.
2. Attach the TempScan20 using four M6 screws.
 - ▶ The TempScan20 is now installed and ready for grounding and wiring.

5.3 Ground

There are two options for grounding the TempScan20:

Grounding via Protective Conductors

Connect the ground pin of the TempScan20 with a protective conductor. The protective conductor must have an eyelet and a minimum cross-section of 4 mm² (12 AWG). The eyelet must be positioned between a nut and a toothed washer.

The engine, the TempScan20 and all associated equipment should be grounded via a common point.

Grounding Using a Ground Strap

Instead of a protective conductor, a ground strap can be used, which at the same time helps to dissipate interference currents. The ground strap must possess the following characteristics:

- Design – flat, no-core braid with suitable eyelet for the ground pin
- Width – 1.3 cm (0.5")
- Maximum length – 30 cm (12") and a suitable eyelet for the ground pin

6 WIRING



Shielding of Leads

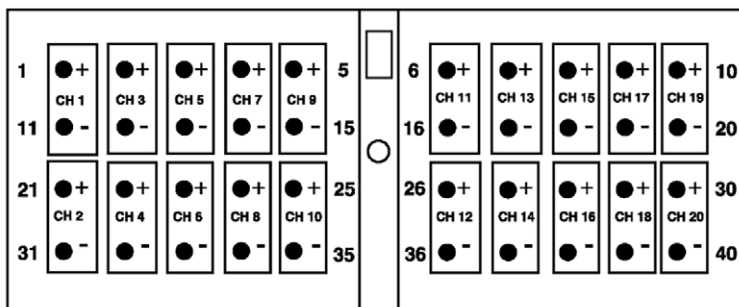
The leads of the thermocouples and the CAN wiring should be shielded with a twisted pair as follows:

- The thermocouple shielding should be connected to the ground pin.
- The shielding can be simply cut off at the thermocouple.
- The thermocouple leads should not be laid for more than 5 cm (2") without shielding.

6.1 Connections

The TempScanzo has the following connections:

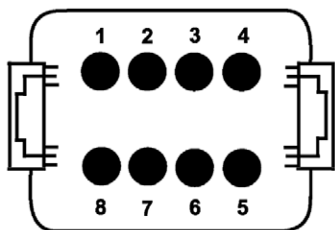
Connection for Thermocouples



You can connect a thermocouple to every channel using a type DRC-40SA Deutsch connector; (in the connection socket diagram the channels are marked *CH1* to *CH20*) . Each channel can be configured separately using the PowerView3 (see section: *Configuring Channels* on page 22).

6 WIRING

Connection for Power Supply, CAN and RS232



| Pin | Assignment |
|-----|------------|
| 1 | PWR+ |
| 2 | CAN-H |
| 3 | CAN-L |
| 4 | PWR- |
| 5 | Shield |
| 6 | RS-232 GND |
| 7 | RS-232 TXD |
| 8 | RS-232 RXD |

Connect the power supply and CAN bus using a type DT13-o8SA Deutsch connector.

6.2 Connecting Thermocouples

You can connect up to 20 thermocouples to your TempScan20 via the type DRC-40SA Deutsch connector. The TempScan20 supports the thermocouple types B, E, J, K, N, R, S and T. It is possible to connect different types at the same time.



Use the correct thermocouples

Using unsuitable thermocouples may return false data.

Make sure that the thermocouples are suitable for the proposed use. Read the documentation supplied with your thermocouples.



Mounting the thermocouples

Make sure the thermocouples are properly installed. Read the documentation supplied with your thermocouples.

Proceed as follows:

1. Slide the large protective cap onto the wiring harness.
2. Connect the thermocouples to the plug connector using the contacts provided. The pin assignment can be found in *Connections* on page 15.
3. Close the unused connections of the connector with sealing plugs, and slide the protective cap back onto the connector.
4. Ensure that the power supply to the TempScan20 is disconnected.
5. Insert the connector into the correct socket on the TempScan20 and screw it tight.
 - ▶ The thermocouples are connected to the TempScan20.

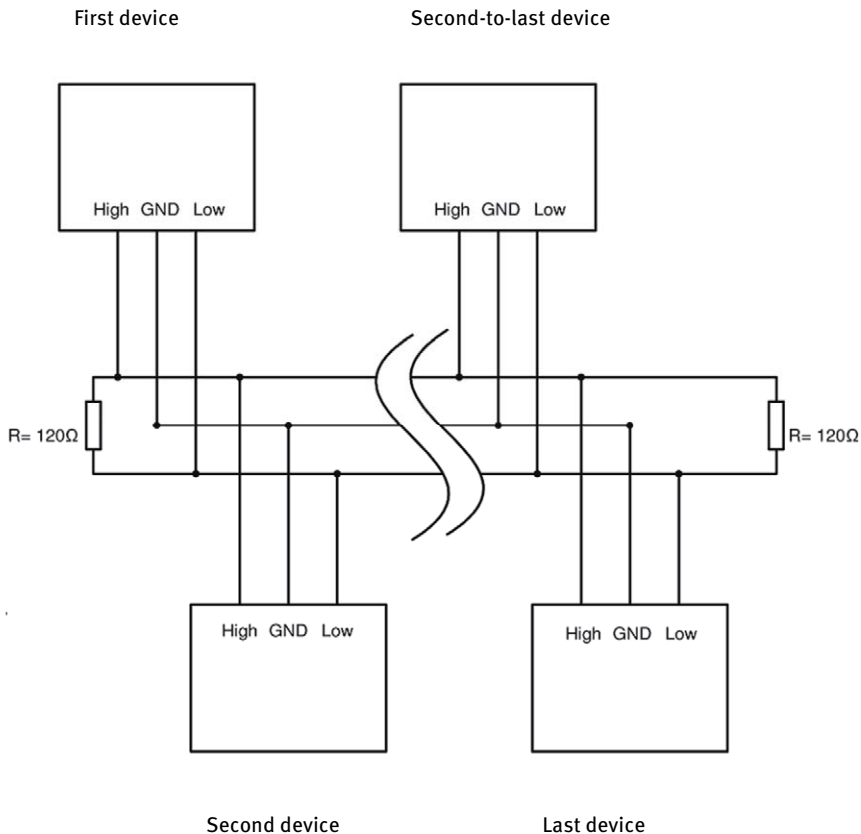
6.3 CAN Bus Wiring

General Information on CAN Bus Wiring

The CAN bus wiring requires three conductors: (CAN High, CAN Low und CAN Ground). The conductors for CAN high and CAN low must be twisted wires. The bus may only have a maximum wire length of 250 m (820 ft) and must be connected on both ends by a terminating resistor of 120 Ω between the CAN High and CAN Low wires, to prevent reflections.

6 WIRING

The diagram shows an example of the wiring for four devices:



CAN bus wiring

Note the following when connecting the CAN bus:

- There can be a maximum of 110 devices connected to one CAN bus.
- The maximum wire length is 250 m (820') depending on the transfer rate.
- Each bus end must be fitted with a terminating resistor of 120 Ω (see drawing).

Settings on the Devices

All connected devices are designated as nodes on the CAN-bus. Each node is identified by a CANopen node ID-. These node numbers must be indicated both in the connected devices as well as in the configuration of the PowerView3. Refer to the operating manuals for the respective devices for instructions on how to set the node ID on each device and if further settings must be made to communicate via the CAN bus.

A node ID can only be assigned once within a CAN bus and must be a number between 1 and 127. Note that some devices use several node numbers. The node numbers must be assigned in the configuration after start-up of the PowerView3.



Overview of the CAN bus

Setting up the CAN field bus requires the following settings:

- Activate CAN interface on the devices if applicable.
- Assign unique CANopen node IDs to the devices.
- Set transfer rate of all devices to 250 kBit/s



CANopen protocol

If you require information on the CANopen protocol, please contact your MOTORTECH contact person.

6.4 Connection to Power Supply and Can Bus

The device is connected to the power supply and the CAN bus via a type DT13-o8SA Deutsch connector.

1. Slide the small protective cap onto the wiring harness.
2. Connect the CAN bus and the power supply to the power connector with the wedge lock and the provided contacts. The pin assignment can be found in section: *Connections* on page 15.
3. Close the unused connections of the connector with sealing plugs, and slide the protective cap back onto the connector.
4. Make sure that the thermocouples are connected (see section: *Connecting Thermocouples* on page 16).
5. Insert the connector into the correct socket on the TempScan20.
 - ▶ The TempScan20 is connected to the CAN bus and the power supply.
 - ▶ The TempScan20 starts measuring temperatures.

7 SETTINGS IN THE POWERVIEW3

In order to use the TempScan20, you have to add and configure it in the PowerView3. If required, you can first change the node ID and the baud rate of the TempScan20 via the PowerView3.

7.1 Changing the Node ID and Baud Rate



Disconnect all other devices from the CAN bus!

When LSS commands are transmitted, all devices connected to the CAN bus are addressed. In order to change the baud rate or the node ID only of the desired device, no other devices may be connected to the PowerView3 via the CAN bus. Disconnect all other devices from the CAN bus.



MOTORTECH devices are set to 250 kbd.

MOTORTECH devices are usually delivered with the baud rate set to 250 kbd. If you change the baud rate, it can lead to problems in communicating via the CAN bus.

You can change the node ID and baud rate of the TempScan20 in the PowerView3 in the view: *Communication Setup*:

Open the Communication Setup view:

Start Menu -> Connection

MOTORTECH® PowerView3 Communication Setup

PowerView3

Node ID

Baud Rate

☐ 500 kbd ☐ 125 kbd

☒ 250 kbd ☐ 100 kbd

LSS Commands

Node ID

Baud Rate

☐ 500 kbd ☐ 125 kbd

☐ 250 kbd ☐ 100 kbd

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Change Node ID

Change the node ID of the TempScan20 as follows:

1. Make sure that only the device whose node ID you want to change is connected to the PowerView3 via the CAN bus.
2. In the *LSS Commands* area, enter the node ID that the connected TempScan20 is to be given.
3. Tap *Transmit Command*.
 - ▶ The node ID of the connected device is changed.

Change Baud Rate

Change the baud rate of the TempScan20 as follows:

1. Make sure that only the device whose baud rate you want to change is connected to the PowerView3 via the CAN bus.
2. In the *PowerView3* area, select the current baud rate of the TempScan20 whose setting you want to change.
3. Tap *Save*.
 - ▶ The baud rate of the PowerView3 is changed. It corresponds to the current baud rate of the TempScan20 whose settings you want to change.
4. In the *LSS Commands* area, select the node ID that the TempScan20 whose baud rate you want to change, is to be given.
5. Select the baud rate that the TempScan20 is to be given.
6. Tap *Send Command*.
 - ▶ The baud rate and the node-ID of the TempScan20 are changed.
7. In the *PowerView3* area, change the baud rate to the value that you have entered for the connected device in the *LSS Commands* area.
8. Tap *Save*.
 - ▶ The baud rate of the PowerView3 is changed.
 - ▶ The baud rates of the TempScan20 and the PowerView3 are identical.

7.2 Add Device

In the HMI module PowerView3 from MOTORTECH, add the TempScan20 to the connected devices as follows:

Open the *Device Setup* view:

Start Menu -> Devices

1. If you have not already done so, activate the device type TempScan20.
2. In the *Device Setup* view, add a TempScan20 with the correct node ID to the list of monitored devices. The node ID 80 has been preset as a factory setting in the TempScan20.

7 SETTINGS IN THE POWERVIEW3

- The TempScan20 is added in the PowerView3.

MOTORTECH® PowerView3
Device Setup

Remote Device

Device1: DetCon2/20
Device2: MIC4
Device3: TempScan20

Class: Ignition Controller
Node ID: 29

Add Edit

Remote Device Logging: OFF
Activate

Device Type
Activate
Backup

Digital Outputs: ON
Deactivate
Warn Error Test

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08:14

Further information can be found in the PowerView3 operating manual.

7.3 Configuring Channels




Further configuration options

There are further configuration options for the TempScan20. These are described in the PowerView3 operating manual.

Configure the TempScan20 as follows:

Open the view: *Settings Channel 1:*

Start Menu -> TempScan20 -> Settings -> Channels



TempScan20 : 127
Settings Channel 1

Tag

Cyl 1

Name

Cylinder 1

Thermocouple

Type J

Status

☒ Channel Enabled
☒ Warning Output ☒ Error Output

Group

☒ Bank A ☒ Cyl 1 - 6
☐ Bank B ☐ Room Temp

Limits

| | | | | | |
|---------------|--------|--|--|--|--|
| Shutdown High | 240 °C | | | | |
| Warning High | 120 °C | | | | |
| Warning Low | -20 °C | | | | |

Start



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Use buttons  and  to switch between channels 1 to 20. Carry out the following steps for all channels which have a thermocouple connected to them:

1. Assign an abbreviation (max. five characters) and a channel name (max. 20 characters).
2. Enter the correct thermocouple type. The following types are possible B, E, J, K, N, R, S and T.
3. Activate the channel.
4. Activate *Warning Output* and *Error Output* (if the PowerView3 is intended to switch the digital outputs when temperature thresholds are exceeded).
5. Assign the channel to one or several groups.
6. Configure the upper and lower warning thresholds and the upper shutdown threshold:

With  and  in steps of 1 °C or 1 °F

With  and  in steps of 20 °C or 20 °F

7 SETTINGS IN THE POWERVIEW3



Minimum separation of threshold values

The threshold values *Low Temp. Warning*, *High Temp. Warning* and *High Temp. Shutdown* must each be separated by at least 10 °C (18 °F).

- ▶ The TempScan20 measures the temperature for all configured channels.
- ▶ If the digital outputs are activated in the PowerView3, these will be switched when thresholds are exceeded or undershot.

Further information can be found in the PowerView3 operating manual.

Saving

In the *Settings* view, (accessed via *Start Menu* -> *TempScan20* -> *Preferences*), tap the *Save* button to permanently save the following information in the TempScan20:

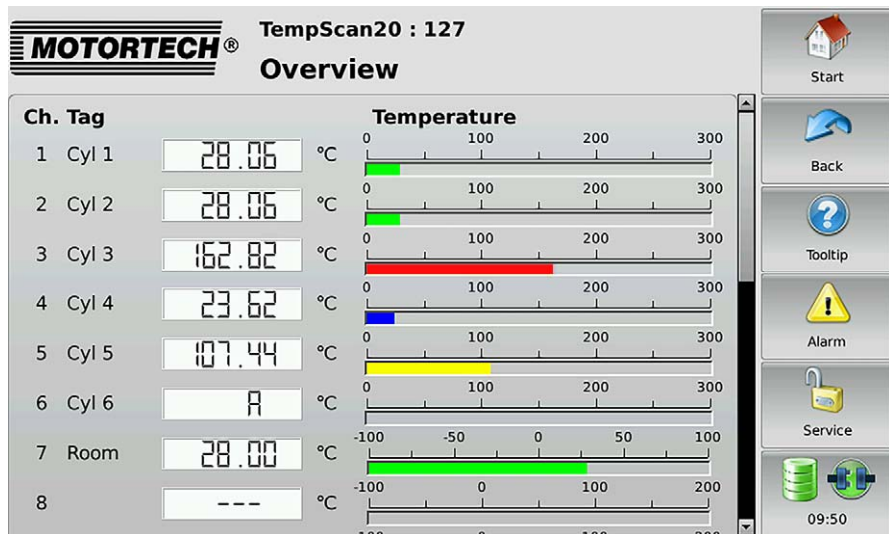
- Warning and shutdown thresholds
- Thermocouple types
- The information whether a channel is activated or deactivated.

If you do not save this information, it will be lost when the PowerView3 is switched off!

8 MEASURING TEMPERATURES

Measured temperatures are transmitted by the TempScan20 via the CAN bus. The PowerView3 from MOTORTECH offers the following options:

- Visualization of measured temperatures (e. g. in the view *Overview*, accessed via *Start Menu* -> *TempScan20* -> *Overview*).



This view lists all the channels of the TempScan20:

- *Ch.*: Channel number
- *Tag*: user-specified abbreviation
- The currently measured temperature (A = thermocouple failed | --- = channel not configured)
- The colors of the temperature displays depend on the threshold settings.
- Recording of measured temperatures
- Switching of the digital outputs

Further information can be found in the PowerView3 operating manual.

8 MEASURING TEMPERATURES

Further processing of recorded data on the PC

With the aid of the *MOTORTECH Trend Viewer* you can process data on your PC that has been recorded with the PowerView3. The software provides the following options:

- Visualization of data
- Export of data as CSV file
- Export of data as graphic file

Further information can be found in the MOTORTECH Trend Viewer operating manual.

9 OPERATION

9.1 Start-up

Enable the device as follows:

1. Make sure the thermocouples are properly connected to the TempScan20 (see section: *Connecting Thermocouples* on page 16).
2. Connect the device to the CAN bus (see *CAN Bus Wiring* on page 17).
3. Establish the power supply (see *Connection to Power Supply and Can Bus* on page 19).
 - ▶ The TempScan20 starts automatically after establishing the power supply .
 - ▶ After five seconds the TempScan20 starts to transmit measured data via the CAN bus.

9.2 Shutdown

Shut down the device as follows:

1. Interrupt the power supply (see *Connection to Power Supply and Can Bus* on page 19).
 - ▶ The TempScan20 switches off automatically after interruption of the power supply.
2. Separate the device from CAN bus (see *CAN Bus Wiring* on page 17).
 - ▶ The device is out of service.

10 FAULTS

10.1 Possible Faults

| Fault | Possible cause | Possible Solution |
|---|--|--|
| Measured values are incorrect. | Wrong thermocouple type settings | Enter the correct thermocouple type in the PowerView3 (see section: <i>Settings in the PowerView3</i> on page 20). |
| | The thermocouple is faulty. | Replace the thermocouple (see section: <i>Connecting Thermocouples</i> on page 16). |
| A thermocouple does not display any measured values. | The relevant channel is not activated. | Activate the relevant channels in the PowerView3 (see section: <i>Settings in the PowerView3</i> on page 20). |
| | The thermocouple is faulty. | Replace the thermocouple (see section: <i>Connecting Thermocouples</i> on page 16). |
| | The thermocouple is not connected properly. | Connect the thermocouple correctly (see section: <i>Connecting Thermocouples</i> on page 16). |
| The TempScan20 cannot be configured. | The baud rate of the TempScan20 does not correspond to that of the PowerView3. | Change the baud rate of the TempScan20 (refer to PowerView3 operating manual). |
| | The TempScan20 has been assigned with the wrong node ID in the PowerView3. | Enter the correct node ID for your TempScan20 in the PowerView3 (refer to PowerView3 operating manual). |
| A threshold value cannot be set to the desired temperature. | Threshold values are too close to each other. | Threshold values must differ by a minimum of 10 °C (18 °F). |

10.2 Customer Service Information

You can reach our customer service during business hours at the following phone and fax number, or by e-mail:

Phone: +49 5141 93 99 0

Fax: +49 5141 93 99 99

Email: service@motortech.de

10.3 Returning Equipment for Repair / Inspection

To return the device for repair and inspection, obtain a return form and return number from MOTORTECH.

Fill out the return form completely. The completely filled out return form guarantees fast, uncomplicated processing of your repair order.

Send the device and the return form to one of the two addresses below or to the nearest MOTORTECH representative:

MOTORTECH GmbH

Hogrevestr. 21-23
29223 Celle

Germany

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10.4 Instructions for Packaging the Equipment

For return shipment, equipment should be packaged as follows:

- Use packaging material that does not damage the equipment surfaces.
- Wrap the equipment with sturdy materials and stabilize it inside the packaging.
- Use sturdy adhesive film to seal the packaging.

11 MAINTENANCE

Please follow the following maintenance instructions:

Do not use caustic liquids or steam cleaners for cleaning the device.

- Clean the thermocouples at regular intervals.
- Check the wiring at regular intervals.
- Check all plug-in connections for proper condition.

Original MOTORTECH® Accessories for Stationary Gas Engines

As a supplier, MOTORTECH develops, produces and distributes accessories as well as spare and wearing parts for nearly all kinds of stationary gas engines worldwide: Ignition control and monitoring, industrial spark plugs and high tension leads, wiring systems and gas regulation – from detonation to speed control and complete gas engine management. On-site support and special training courses complete our service.



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