NEMA TS 4-2023

Hardware Standards for Variable Message Signs (VMS) and Dynamic Message Signs (DMS) with NTCIP Requirements

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Foreword

This NEMA technical publication, TS 4-2023 *Hardware Standards for Variable Message Signs (VMS) and Dynamic Message Signs (DMS) with NTCIP Requirements*, was developed to standardize minimum performance requirements and specifications for design and implementation of dynamic traffic messaging equipment that can be safely installed and provided to the end user with operational features based on current technology. Within NEMA TS 4-2023, any reference to a specific manufacturer is strictly for the purpose of defining interchangeability where there exists no nationally recognized standard covering all the requirements. The manufacturer references do not constitute a preference. NEMA TS 4-2023 is intended to reduce hazards to persons and property when traffic messaging equipment is properly selected and installed in conformance with the requirements herein.

A future version of NEMA TS 4-2023 may address alternative non-grid power sources.

The user's attention is called to the possibility that compliance with NEMA TS 4-2023 may require use of an invention covered by patent rights. By publication of NEMA TS 4-2023, no position is taken with respect to the validity of any claims or of any patent rights in connection therewith.

In the preparation of NEMA TS 4-2023, input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product subdivision by contacting:

NEMA Technical and Industry Affairs Department
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The Variable Message Sign and Dynamic Message Sign Technical Committee developed NEMA TS 4-2023 under the auspices of the NEMA Transportation Management Systems and Associated Control Devices Section (TN-TS), of which it is a part.

At the time that NEMA TS 4-2023 was prepared, the following NEMA members and their representatives were active voting members of the NEMA TN-TS Variable Message Sign and Dynamic Message Sign Technical Committee (TN-TS CMS TC):

Daktronics, Inc.	http://www.daktronics.com/	Jason Morrison (Chair)
Daktronics, Inc.	http://www.daktronics.com/	Dan Bierschbach
Daktronics, Inc.	http://www.daktronics.com/	Berniece Stuefen
Daktronics, Inc.	http://www.daktronics.com/	Mike Van Hofwegen
Parsons	http://delcantechnologies.com/	Russ Brookshire
Parsons	http://delcantechnologies.com/	Jon Wyatt
Skyline Products, Inc.	http://www.skylineproducts.com/	James Barnhart
Skyline Products, Inc.	http://www.skylineproducts.com/	Pat Cochran
Sunrise SESA Technologies, Inc.	https://sesa.sunrisesesatech.com/	Luke Collier
Sunrise SESA Technologies, Inc.	https://sesa.sunrisesesatech.com/	Chad Bodemann
Ver-Mac, Inc.	http://www.ver-mac.com/	Serge Beaudry
Ver-Mac, Inc.	http://www.ver-mac.com/	Pier Castonguay
Ver-Mac, Inc.	http://www.ver-mac.com/	Stephane Lapierre
Yunex Traffic	https://www.yunextraffic.com/global/en/	Dave Miller

TN-TS section approval of NEMA TS 4-2023 does not necessarily imply that all section members voted for its approval or participated in its development. When NEMA TS 4-2023 was approved, the Transportation Management Systems and Associated Control Devices Section was composed of the following members:

360 Network Solutions, LLC	www.360ns.net
Applied Information, Inc.	appinfoinc.com
Daktronics, Inc.	www.daktronics.com
Eberle Design, Inc.	www.editraffic.com
Horizon Signal Technologies, Inc.	www.horizonsignal.com
Intelight, a Q-Free Company	www.intelight-its.com
John Thomas, Inc.	www.jtitraffic.com
McCain Inc.	www.mccain-inc.com
Panasonic Corporation of North America	na.panasonic.com
Parsons	delcantechnologies.com
Qualcomm	www.qualcomm.com
Siemens Industry, Inc.	www.industry.usa.siemens.com
Skyline Products, Inc.	www.skylineproducts.com
Sunrise SESA Technologies, Inc.	www.sunrisesystems.com
Temple, Inc.	www.temple-inc.com
Ver-Mac, Inc.	www.ver-mac.com

History

As the implementation of dynamic message signage and general light emitting technology increased in the United States during the late 1980s and early 1990s, various transportation departments tried a number of diverse technologies to meet their signing needs. This eventually led to a wide variety of agency specifications developed across the country, a number of opposing philosophies for implementation by the users, and some unsubstantiated claims by manufacturers. It also led to conflicting definitions and references from one agency to the next for what constituted a dynamic message sign (DMS) or its use.

In 1995, based on industry need, NEMA created the NEMA 3TS Transportation Section.

In August 1997, the DMS manufacturers formed a new committee of the NEMA Transportation Section and met for the first time to outline a plan for developing this hardware standard. Between 1997 and 2005, the NEMA 3TS section developed NEMA TS 4-2005. In 2005, NEMA TS 4-2005 was published and used by the transportation industry.

In 2012, the NEMA 3TS Section authorized a project to revise the existing NEMA TS 4-2005. That project resulted in NEMA TS 4-2016, which removes older CMS technology and incorporates the new full color technology available. The 3TS Section, particularly its Variable Message Sign and Dynamic Message Sign Technical Committee, also worked to harmonize NEMA TS 4-2016 with EN 12966-1 for environmental, display, and testing requirements. The major sections overhauled during this project were Section 2 Environmental Requirements, Section 5 Display Properties, and Section 8 Electronics and Electrical. Minor revisions occurred in other portions of NEMA TS 4-2016 to reflect the removal of older display technologies. NEMA TS 4-2016 incorporates all of the current best practices of the industry for specifying a VMS and DMS.

In 2023, the Transportation Systems Section and Variable Message Sign and Dynamic Message Sign Technical Committee revised NEMA TS 4-2016 to include language regarding U.S. and Canadian regulations for radio interference requirements, a minimum display refresh rate requirement to minimize impact on autonomous vehicles, and standards/definitions for Variable Message Signs (VMS) and Dynamic Message Signs (DMS).

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Section 1
General

1.1 Scope and Introduction

The goal of NEMA TS 4-2023 is to provide the user with safe, dependable, functional, and easily maintained Variable Message Sign (VMS) and Dynamic Message Sign (DMS) equipment.

NEMA TS 4-2023 defines the minimum hardware and functional characteristics of electronically controlled VMS and DMS used for displaying messages to travelers.

NEMA TS 4-2023 predominantly addresses VMS and DMS.

Conformance to NEMA TS 4-2023 is defined in Section 11.

Portions of NEMA TS 4-2023 may be referenced as part of agency (procurement) specifications.

NEMA TS 4-2023 is not intended to be an application guide, nor is it meant to take the place of any application guides for DMS or VMS.

Items such as sign siting practices, selection of character heights, siting of cabinets and relations between legibility and travel speed, etc., were all considered to be outside the scope of NEMA TS 4-2023.

1.2 References

The following standards (normative references) contain provisions which, through reference in this text, constitute provisions of NEMA TS 4-2023. Additional documents and standards (other references) are referenced that might provide a more complete understanding. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard should apply the most recent editions of the standards indicated.

1.2.1 Normative References

AASHTO LTS-6	*Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Edition*
ASTM E810-20	*Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting Utilizing the Coplanar Geometry*
CIE 1931	*Color Specification—The CIE 1931 Standard Colorimetric System and the CIE 1964 Supplementary Standard Colorimetric System*
EN 12966 A1:2018	*Road vertical signs—Variable message traffic signs*
FMVSS, Part 571	National Highway Traffic Safety Administration, 49 CFR Part 571, *Federal Motor Vehicle Safety Standards (FMVSS)*
Highways Regulations	23 CFR, Appendix to Subpart F
IEC/EN 61000-6-1:2016	*Electromagnetic compatibility (EMC)—Part 6-1: Generic Standards—Immunity standard for residential, commercial and light-industrial environments*
IEC 61000-4-4:2012	*Electromagnetic compatibility (EMC)—Part 4-4: Testing and measurement techniques—Electrical fast transient/burst immunity test*