/// Plug-in voltage monitoring railway relay with 4 C/O contacts

Rugged plug-in relays for extreme reliability, within long endurance applications and harsh environments

MTDV4-U200N

Timer relay

Part of D-platform

Description

Plug-in electronic railway voltage monitoring relay with four change-over contacts for reliable switching of very low currents (1 mA @ 5 VDC) up to currents of 10A @ 110VDC.

The relay has optionally a delay on pull-in and/or on drop-out. The delay time is adjustable with a lockable knob (either delay-on or delay-off, the other delay is fixed). The relay can also be supplied with fixed time delays (no knob). The pull-in voltage (Uon) and drop-out voltage (Uoff) are both adjustable via internal screws. The relay can also be supplied with a fixed pull-in and drop-out voltage. Suitable for monitoring DC voltages.

The MTDV4-U200N offers a very small hysteresis (difference between pull-in and drop-out voltage). The relay is equipped with a LED which indicates the status of the relay contacts and activation of the time delay. Delay-off function for voltage drop up to 50% of minimum pull-in voltage, no auxiliary supply necessary.

The built-in magnetic arc blow-out ensures adequate DC breaking capacity resulting in long contact life. The integrated contact separation prevents cross pollution of contacts. On the relay cover the serial number and data matrix code are shown for ease of traceability.

The construction of the relay and choice of materials make the MTDV4-U200N relay suitable to withstand low and high temperatures, shock & vibrating and dry to humid environments. No external retaining clip needed as integrated ‘snap-lock’ will hold relay into socket under all circumstances and mounting directions.

Features

- DC voltage monitoring relay with time delay
- Compact plug-in design
- 4 C/O contacts
- Drop-out and pull-in voltage adjustable via internal screws
- Also available with fixed pull-in and drop-out voltage (no internal screws)
- Time delay on pull-in and/or drop-out
- 1 delay time adjustable with a lockable knob, other delay time fixed
- Also available with fixed time delays (no knob)
- No auxiliary supply necessary
- Magnetic arc blow-out ensuring long contact life
- 1 LED for status indication
- Minimum switching current 1 mA
- Maximum continuous current 10 A
- Wide temperature range -40 ºC...+70 ºC
- Mechanical life > 30 million operations
- Electrical life e.g. > 10 million operations at 0.5 A, 24 VDC
- Data matrix code with serial number for traceability
- Integrated snap-lock, no external retaining clip needed
- Transparent cover for visual inspection
- Many options and sockets available

Application

The MTDV4-U200N is used in demanding rolling stock applications for voltage monitoring with or without time delay(s). Relays continue to play a vital role in reliable train operation. Key functions are galvanic isolation between control (computers/ PLC’s) and power circuits providing system isolation, contact multiplication and amplification.

Other unique features are:

- predictable failure behavior (Fail Safe) making system safety validation a lot more simple than using computer based solutions like PLC’s
- long term availability (no obsolescence)
- easy maintenance by plug-in feature and transparent cover
- unlike more sensitive electronics, relays are insensitive to EMI

Using these features one can build a hardwired, fail safe control system which is cyber secure and insensitive to electro magnetic disturbances and surges. Relays are ideal to use in trains for signal transfer/repeat, safety interlocking functions (brake - doors), load on-off switching and sub-system isolation.

Railway compliancy

EN 50155: 2017	EN 50121-3-2: 2016
IEC 60571: 2012	EN 45545-2: 2015
IEC 60947-5-1: 2016	NF F16-101/102
IEC 61373: 2010	IEC 60947-5-4: 2002

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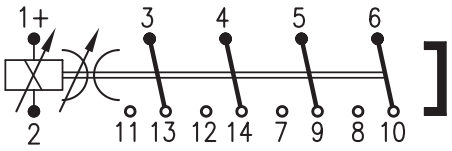
Options

- Gold plated contacts
- IP50 dust protection (only for fixed voltage settings)
- Red LED indicator
- $AgSnO_2$ contacts, weld resistant for capacitive loads
- Double zener diode
- Double make/double break contacts
- Keying (coding relay to correct socket)

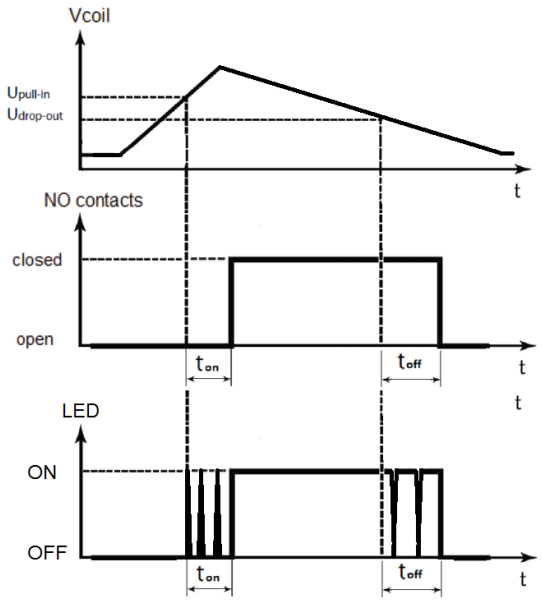
Remark: Not all combinations possible

Connection diagram

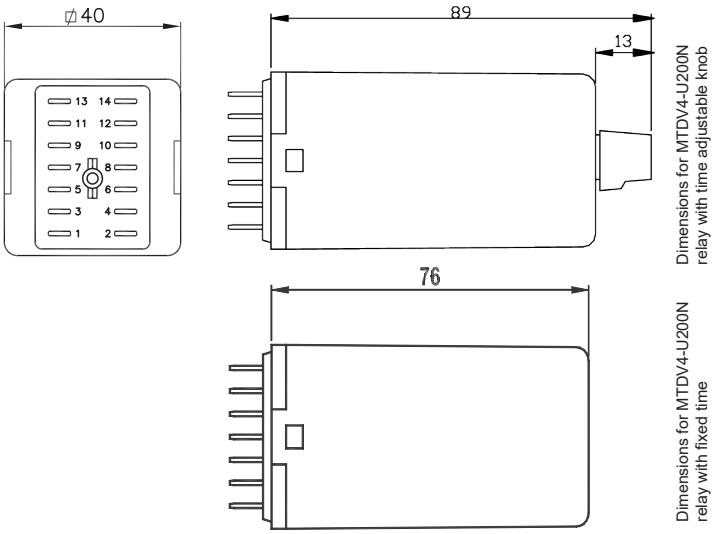


Example with adjustable voltage and adjustable delay-on

Timing diagram



Dimensions (mm)



Weight

~ 145 g

Serializing

Each relay is marked with a unique serial number to which link important information and test results.

The GTIN (Global Trade Item Number) and part number are printed on each relay in both text and data matrix code according the worldwide recognized GS1 standard, being able to scan each relay for logistical and traceability purposes.

Sockets

		Mounting			
		Surface / Wall	35 mm rail	Panel / Flush	PCB
Terminal connection	Screw	V23	V23	-	-
	Screw - wide terminals	V22 BR	V23 BR	-	-
	Spring clamp	V29	V29	V33	-
	Faston	-	-	V31	-
	Crimp	-	-	V26	-
	Solder tag	-	-	V3	-
	PCB	-	-	-	V32

For more information see the respective datasheets

Over 10 million Mors Smitt relays in use in rail transport applications worldwide!

Technical specifications

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Voltage characteristics

Voltage settings		Drop-out and pull-in both adjustable, or both fixed value
Minimal hysteresis		2 % x Upull-in
Accuracy	Adjustable voltages pre-set in factory	Max. ± 1 % deviation of maximum adjustable value. Remark: when checking pre-set voltages on required values take the time delay into account! For series production when required values are known, fixed values instead of pre-set values should be used for optimal accuracy.
	Fixed voltages	Maximum deviation ± 0.25 % of fixed voltage
Repeatability	Adjustable voltages	Maximum deviation ± 1 % of set voltage
	Fixed voltages	Maximum deviation ± 0.5 % of fixed voltage
Voltage variation	Temperature	Maximum ± 0.02 % / K from 20 ˚C

Example pull-in voltage:
Relay MTDV4-U204N-Lr 0s/0s 90/110VDC
Accuracy ± 0.25 %: pull-in voltage is for example 110.3 VDC (worst case situation)

Actual situation:
- Ambient temperature +40 ºC ⇨ 20 degrees different compared to 20 ºC ⇨ time variation 20 x 0.02 = 0.4 %
Real pull-in time: 110.3 V ± 0.5 % (repeatability) ± 0.4% (temperature variation) = 110.3 V ± 0.9 %
In this case every actual pull-in voltage will be between 109.3 V and 111.3 V.

Time delay characteristics

Time delay function		Delay on pull-in and/or delay on drop-out
Available adjustable time ranges		0-1 s 0-3 s 0-6 s 0-10 s 0-30 s 0-60 s
Available fixed time		Any time between 0.5 s - 60 s on request (0 s for no delay time)
Accuracy	Adjustable time	Maximum deviation between visual setting of the knob and set time is ± 8 % of full scale value
	Adjustable time, pre-set in factory	Maximum deviation ± 4 % of full scale value
	Fixed time	Maximum deviation ± 1 % of fixed time (± 2 % for fixed times < 1 s)
Repeatability	Adjustable time	Maximum deviation ± 2 % of set time ± 50 ms
	Fixed time	Maximum deviation ± 0.5 % of fixed time ± 50 ms
Time variation	vs voltage variation	± 0.05 % / % deviation from stated average pull-in voltage
	vs temperature variation	± 0.02 % / K deviation from 20 ºC
Operating times at nominal voltage without time delay:	Pull-in time	< 75 ms (increasing voltage) < 350 ms (voltage switched from 0 to Umax)
	Release time	< 75 ms (decreasing voltage) < 50 ms (voltage switched from Umax to 0)

Example time delay:
Relay MTDV4-U204N-Lr 1.9s/0s
Average pull-in voltage is mentioned in table Coil characteristics: 120 VDC
Accuracy ± 1 %: time delay after set in factory is for example 1.92 s (worst case situation)

Actual situation:
- Supply voltage 70% Unom ⇨ 30 % different compared to average pull-in voltage ⇨ time variation 30 x 0.05 % = 1.5 %
- Ambient temperature +60 ºC ⇨ 40 degrees different compared to 20 ºC ⇨ time variation 40 x 0.02 = 0.8 %
Real delay time: 1.92 s ± 0.5 % ± 50 ms (repeatability) ± 1.5 % (voltage variation) ± 0.8% (temperature variation) = 1.92 s ± 2.8 % ± 50 ms
In this case every actual time delay will be between 1.82 s and 2.02 s.

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Coil characteristics

Type	Drop-out Uadjustable (VDC)	Pull-in Uadjustable (VDC)	Current consumption (mA) monitoring only, relay switched off	Current consumption (mA) relay switched on
MTDV4-U201N	15-60	20-60	2	21
MTDV4-U202N	30-120	40-120	2.5	12
MTDV4-U204N	45-180	60-180	3	9
MTDV4-U213N	60-240	80-240	3.5	9
MTDV4-U215N	75-300	100-300	4	8

Other types on request
Remark: Maximum adjustable voltage is also the maximum allowable voltage, otherwise the relay can be damaged.
Remark: In June 2019 the coil tape color is changed to yellow. This change has no effect on any of the relay specifications or technical performance.

Example: MTDV4-U204N with drop-out voltage 95 VDC and pull-in voltage 110 VDC and:

Application voltage (VDC)	Current consumption (mA)	Power (W)
30	3	0.1
90	3	0.3
100*	3	0.3
100**	9	0.9
120	9	1.1

* Before relay has pulled in
** After relay has pulled in

Contact characteristics

Contact configuration	4 C/O
Peak inrush current NF F 62-002	200 A (withstand > 10 x 200 A @ 10 ms, 1 min) 80 A (withstand > 10 x 80 A @ 200 ms, 1 min) 40 A (withstand > 10 x 40 A @ 500 ms, 1 min) 30 A (withstand > 10 x 30 A @ 1000 ms, 1 min)
Maximum continuous current	10 A
Maximum switching voltage	250 VDC, 440 VAC
Minimum switching voltage*	5 V
Minimum switching current*	1 mA
Maximum breaking capacity (> 50.000 operations)	110 VDC, 10 A (resistive load) 72 VDC, 5 A (L/R ≤ 40 ms) 110 VDC, 0.5 A (L/R ≤ 40 ms)
Contact resistance	≤ 15 mΩ (initial) @ 5 ADC (Ag, $AgSnO_2$) & @ 10 mAAC (Au)
Material	Ag standard (optional $AgSnO_2$, Au on Ag)
Contact gap	0.7 mm
Contact force	> 200 mN

* Standard silver contacts tested in lab conditions. However we strongly advise to always use gold plated contacts when switching very low currents, as long time reliable operation depends also on switching frequency and environmental conditions. Take recommendations for long time reliability on page 11 into account.

Contact reliability according IEC 60947-5-4

Contact switching load	Contact material	Failure rate λ_c*	Mean number of operating cycles to contact failure m_c*
1 mA , 5 VDC resistive	Gold (option E)	$10x10^{-8}$	10.000.000
5 mA , 24 VDC resistive	Gold (option E)	$7.3x10^{-8}$	14.000.000
10 mA , 50 VDC resistive	Silver (standard)	$3.2x10^{-8}$	31.000.000

*at confidence level 90%

Note: tested in laboratory environment at ambient temperature 20 ºC. To underline the reliability of low current switching in parallel a 1 mA / 5 V test was done using standard silver contacts, resulting in the same reliability. But since real train conditions are far different from lab conditions we strongly advise gold plated contacts for such low contact ratings. Take recommendations for long time reliability on page 11 into account.

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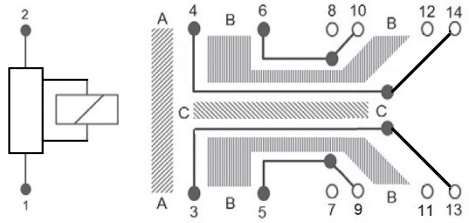
Electrical characteristics

Dielectric strength IEC 60664-1 / EN 50124-1	Pole-pole Cont-coil Open contacts	4 kV, 50 Hz, 1 min 2.5 kV, 50 Hz, 1 min 2.5 kV; 50 Hz; 1 min

Clearance and creepage according IEC 60664-1 / EN 50124-1



Section	Clearance	Creepage	Material group	Unom*
A	≥ 4.0 mm	≥ 4.0 mm	I (CTI600)	≤ 450 V
B	≥ 3.0 mm	≥ 3.0 mm	I (CTI600)	≤ 300 V
C	≥ 6.1 mm	≥ 6.1 mm	I (CTI600)	≤ 696 V

*For basic insulation, PD2 and OV3

Pulse withstanding	IEC 60255-5	5 kV (1.2/50 µs)
Insulation resistance	EN 50155	> 20 MΩ (test voltage 500 VDC)
EMC	EN 50121-3-2	Compliant

Mechanical characteristics

Torque value screw to lock knob	0.2-0.4 Nm

Environmental characteristics

Vibration	IEC 61373, Category I, Class B, Body mounted
Shock	IEC 61373, Category I, Class B, Body mounted
Operating temperature	-40 °C...+70 °C
Operating temperature class	OT4
Humidity	93 %
Maximum altitude	2000 meter. Higher altitudes are possible but have consequences mentioned in IEC 60664 (for example 5000 meter with bigger clearance distance)
Salt mist	IEC 60068-2-11, class ST4
Dry heat	IEC 60068-2-2 test Be
Damp heat	IEC 60068-2-30, Test method Db variant 2
Protection	IEC 60529, adjustable voltages: IP30 fixed voltages: IP40, option K: IP50 (relay on socket)
Fire & smoke	NF F 16-101, NF F 16-102, EN 45545-2: HL3 for requirements R22, R23, R26
Insulation materials	Cover: polycarbonate Base: nylon
Natural cooling or forced ventilation constraints for the equipment	None: no extra measures necessary, relays can be mounted tightly together to save space
REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals	European Regulation No 1907/2006

Timer relay
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RAMS features

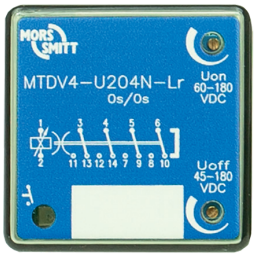
Life class	L4 (Useful life 20 years, take electrical life cycle curves into account)
Repairability	Non-repairable
Maintenance instructions	See inspection/maintenance on page 12
Reliability / lifetime Mechanical lifetime Low energy electrical lifetime High energy electrical lifetime	 > 30 million operations, maximum switching frequency 0.5 Hz (1 million operations at -40 °C) 5 million operations, maximum switching frequency 0.5 Hz See life cycle curves on page 8
Storage precautions	Storage temperature: -50 °C…+85 °C Store in original packaging Silicon free environment

Product labeling

Part number identification	Part number mentioned on top side relay
Serial number identification	Serial number mentioned on top side relay Serial number = Lot number + year + week + reference number
Data matrix code	According GS1 standard, placed on top side relay 01 Global Trade Item Number 240 Part number 21 Serial number Example: 01123456789012324012345678921 1234562209001
Revision index identification	Linked to serial number
Terminals	Identification on bottom plate relay Relay to be used with Mors Smitt relay sockets which have clear terminal identification on each socket

Railway compliancy

EN 50155: 2017	Railway applications - Rolling stock - Electronic equipment
IEC 60571: 2012	Railway applications - Electronic equipment used on rolling stock
IEC 60947-5-1: 2016 / IEC 60947-5-4: 2012	Low-voltage switchgear and controlgear
IEC 61373: 2010	Railway applications - Rolling stock equipment - Shock and vibration tests
EN 50121-3-2: 2016	Railway applications - Electromagnetic compatibility
NF F16-101/102	Railway rolling stock - Fire behavior
EN 45545-2: 2015	Railway applications - Fire protection on railway vehicles Part 2: Requirements for fire behavior of materials and components





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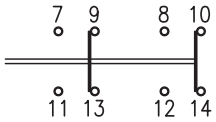
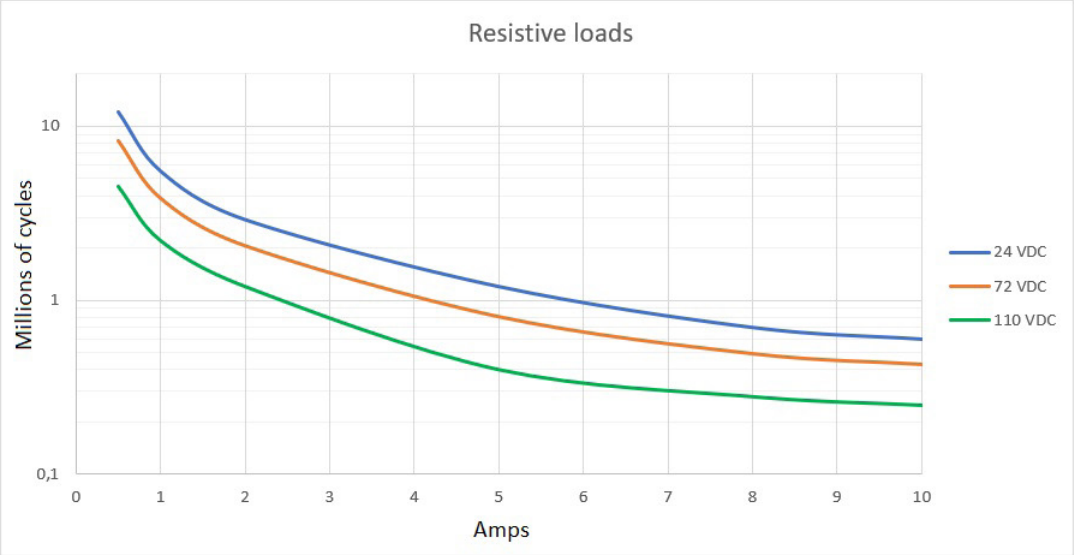
Options

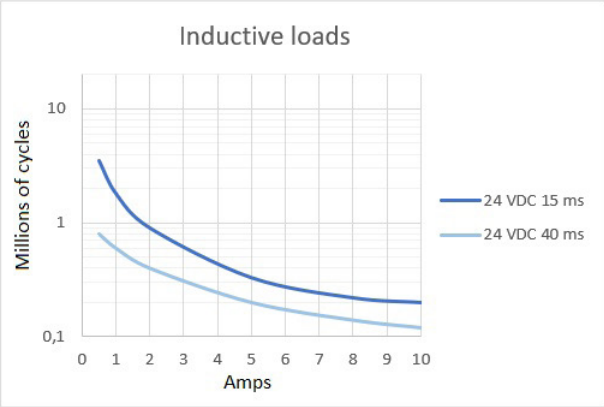
Code	Description	Remark	Cannot be combined with:
Standard options:			
E*	Au; Gold plated contacts		M
K	Extra dust protection	Only for fixed voltage settings. IP50 Cat 2 for the relays mounted in a Mors Smitt socket. Application PD1/PD2 and contact load > 0.5 A.	
Lr	Red LED indicator	Standard included	
Q	Double zener diode over coil	Only for U201, U202 and U204 versions: Maximum allowed peak voltage 180 V, higher voltage will damage the diode.	
Y	Double make/double break contacts, contact gap 1.4 mm	2 C/O DM/DB 	
Keying	Coil coding relay	Also order socket with keying	
Special options:			
M	$AgSnO_2$; “non-weldable” contacts, used for capacitive loads e.g. LED lighting	Icontact > 100 mA	E

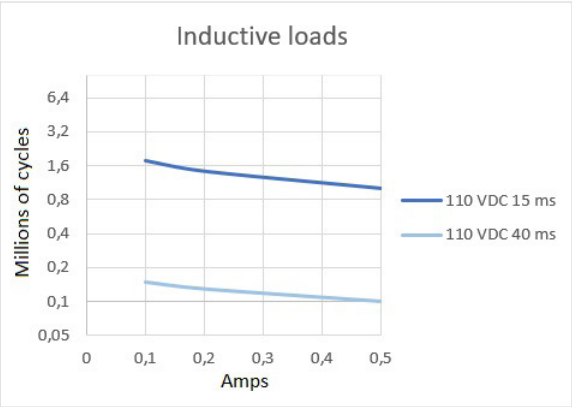
* Gold plated contacts characteristics	
Material	Ag, gold plated
Maximum switching voltage	60 V (higher voltages may be possible, contact Mors Smitt for more information)
Maximum switching current	400 mA (at higher rate gold will evaporate, then the standard silver contact rating of minimum 10 mA and 12 V is valid)
Minimum switching voltage	5 V
Minimum switching current	1 mA

Remark: For application support or technical product support, contact your local Mors Smitt sales office (see contact details on last page).

Electrical life expectancy







By connecting 2 contacts in series the DC current breaking capacity is increased by 50 %. Electrical lifetime is tested under laboratory conditions with switching frequency 0.33 Hz.

Note: The actual electrical lifetime in the application is affected by the switching frequency, type of contact (N/O or N/C), environmental conditions, etc.

For highly inductive loads Mors Smitt A400/B400 relays with standard double make double break contacts are the optimal solution.

Self-cleaning contacts

Each contact attracts organic molecules. When the surface is loaded with a voltage, like a relay contact, the attracting force is even higher. Therefore on each contact surface there is organic “pollution”.

Mors Smitt relays are designed to self-clean during switching of the contacts:

1. Mechanical wiping action: the “pollution” is swept aside.
   The movement of opposing contacts when they make contact: this wiping action cleans the surface of both contacts. Mors Smitt relays are designed for optimal wiping action: enough to clean the surface and not too much to prevent contact wear.
2. Electrical cleaning: the “pollution” is burnt away.
   A current at sufficient level will evaporate organic “pollution”. When switching loads (typically of a current >100 mA), the “pollution” is totally burnt away and a clean contact surface is available.

This results in reliable contact operation without interference due to contact pollution.

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Mounting possibilities/sockets

 V3	 V22BR	 V23	 V23BR	 V26
 V29	 V31	 V32	 V33	

Surface/wall mounting

338000302	V22BR	Screw socket, wall mount, front connection (9 mm terminals)
338000580	V23	Screw socket, wall mount, front connection (7.5 mm terminals)
338000610	V29	Spring clamp socket, wall mount, front dual connection (2.5 mm^2)

Rail mounting

338000580	V23	Screw socket, rail mount, front connection (7.5 mm terminals)
338000402	V23BR	Screw socket, rail mount, front connection (9 mm terminals)
338000610	V29	Spring clamp socket, rail mount, front dual connection (2.5 mm^2)

Panel/flush mounting

338100100	V3	Solder tag socket, panel mount, rear connection
328400100	V26	Crimp contact socket, panel mount, rear connection, A260 crimp contact
338000560	V31	Faston connection socket, rear dual connection (4.8 x 0.8 mm)
338000670	V33	Push-in terminal socket, panel mount, rear dual connection (3.3 mm^2)

PCB mounting

338000561	V32	PCB soldering socket

No external retaining clip needed as the ‘snap-lock’ will hold the relay into the socket under all circumstances and mounting directions (according shock & vibration requirements IEC 61373, Category I, Class B, Body mounted). If regulations require external retaining clips, these are available as well.

For more details see datasheets of the sockets on www.morssmitt.com

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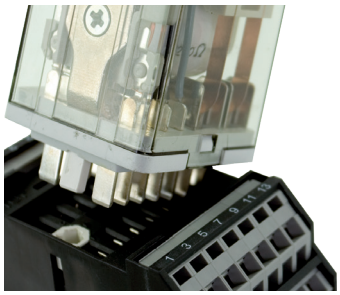
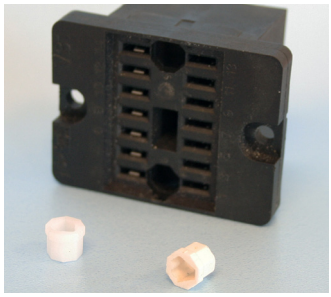
Mechanical keying relay and socket (optional)





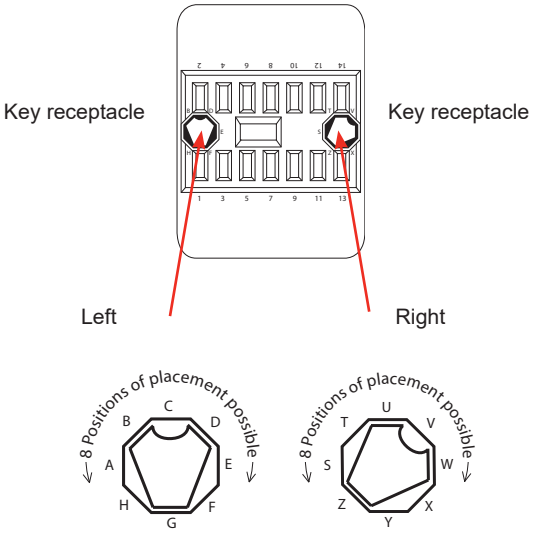
Function:
- To prevent wrong installation
- To prevent damage to equipment
- To prevent unsafe situations

Using keyed relays and sockets prevents a relay is inserted in a wrong socket. For example it prevents that a 24 VDC relay is put in a 110 VDC circuit. Positive discrimination is possible per different function, coil voltage, timing, monitoring, safety and non-safety.

The D relay keying option provides 8 x 8 = 64 possibilities. Upon ordering the customer simply indicates the need for the optional keying. Mors Smitt will assign a code to the relay and fix the pins into the relay. The sockets are supplied with loose key receptacles. Inserting the keys into the socket is very simple and self explanatory.

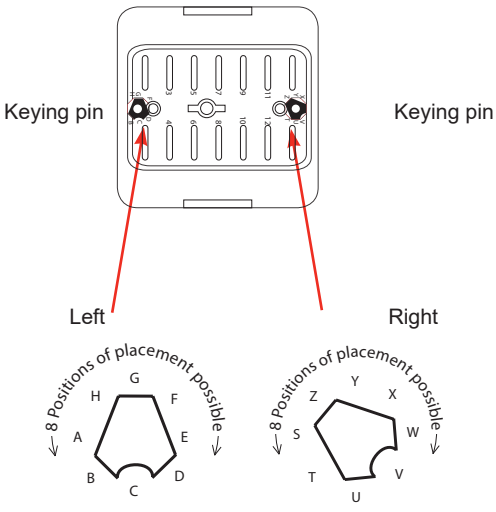
Remark: Sockets and relay shown are examples.

Top view socket



Example keying position G-Z on socket

Bottom view relay



Example keying position G-Z on relay

Keying codes

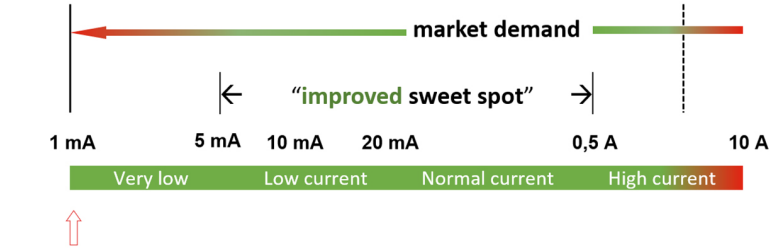
	Coil voltage code				
	U201N	U202N	U204N	U213N	U215N
Silver contacts (standard)	AS	AT	AV	AX	AY
Gold contacts (option E)	DT	HU	HV	AX	HY
Silver tin oxide (option M)	GT	GU	GW	GX	GY

Important for relay selection and operation

Make sure the relay is suitable for the application. For critical applications (for example: green loop applications) relays should be checked for proper operation during periodic inspection.

Contact switching current

Each relay has a range of switching currents in which it performs optimally: the sweet spot. As switching currents are decreasing in field applications, the MTDV4-U200N relay has an improved sweet spot compared to its predecessors.



MTDV4-U200N with gold contacts

Recommendations for long time contact reliability

For relays to enable failure free performance over a very long operational time, it is important to create the right circumstances. In any relay, contact usage and atmospheric conditions influence the contact surface. To counter this effect it is common practice to use a safety factor of > 2 to ensure long time contact reliability.

Therefore for long time contact reliability we recommend:

- Silver contacts: a minimum contact current of 20 mA per contact
- Gold contacts: a minimum contact current of 10 mA per contact
- Double Make Double Break contacts: a minimum contact current of 40 mA per contact
- When low currents are switched not frequently, e.g. 10 mA once a day, it is advised (next to gold plated contacts) to put similar contacts within the same relay in parallel
- With higher load switching, e.g. 110 VDC and > 1 A, put relay contacts in series
- Rule of thumb: any relay works best with switching currents > 20 mA in DC environment when frequently switched. When not switched frequently a higher switching current like 50 mA is better for a long reliable operational time
- When switching capacitive loads (e.g. LED lighting) always use silver tin oxide contacts (minimal contact current 100 mA)
- Check relays regularly, for example visually through the transparent cover

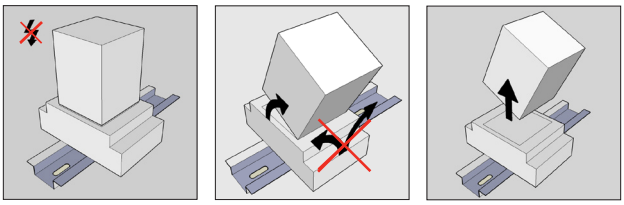
Instructions for use

Installation

Before installation or working on the relay: disconnect the power supply first (no hot swapping)! Install socket and connect wiring according to the terminal identification. Plug relay into the socket ensuring there is no gap between the bottom of relay and the socket. Reverse installation into the socket is not possible due to the mechanical blocking snap-lock feature. Check to ensure that the coil connection polarity is not reversed. Relays can be mounted tightly together to save space. When rail mounting is used, always mount the socket in the direction of the UP arrow, to have proper fixation of the socket on the rail. Torque value screw to lock knob: 0.2-0.4 Nm

Warning!

- Never use silicon in the proximity of the relays
- Do not use the relay in the presense of flammable gas as the arc generated from switching could cause ignition
- To remove relays from the socket, employ up and down lever movements. Sideway movement may cause damage to the coil wires



- Relays should never be swapped to other circuit positions when taken out of its socket for inspection or fault finding, always place it back into the original position to prevent contact resistance problems. Contact resistance problems can be created when swapping relays between different circuit loads due the contact wear/condition having changed during its operational life.

Operation

After installation always apply the rated voltage to the coil to check correct operation. Long term storage may corrode the silver on the relay pins. When plugging the relay into the socket, the female bifurcated or trifurcated receivers will automatically cut through the corrosion on the pins and guarantee a reliable connection.

Before actual use of relays, it is advised to switch the load several times with the contacts. The contacts will both be electrically and mechanically cleaned due to the positive wiping action. Sometimes a contact can build up increased contact resistance (≤ 15 mΩ when new). When using silver contacts one can clean the contact by switching a contact load a few times using >24 VDC & ~ 2A. Increased contact resistance is not always problematic, as it depends on circuit conditions. In general a contact resistance of 1 Ω is no problem, consult Mors Smitt for more information.

Condensation inside the relay housing can occur when it moves from a warm (and humid) environment to a colder environment. This is a normal phenomenon and will not affect the function of the relay. Materials in the relay have no hygroscopic properties.

Inspection / maintenance

Correct operation of the relay can easily be checked as the transparent cover provides good visibility of the moving contacts. If the relay does not seem to operate correctly, check for presence of the appropriate coil voltage and polarity using a suitable multimeter. If a LED is fitted, it indicates voltage presence to the coil. If coil voltage is present, but the relay does not operate, a short circuit of the suppression diode is possible (this may have been caused due to reversed coil connection).

Relays can easily be tested with the Mors Smitt Relay Tester. More information on: www.morssmitt.com.

If the relay doesn't work after inspection, replace the relay with a similar model. Do not attempt to open the relay cover or try to repair. Contacts are calibrated and in balance, touching can affect proper operation. Also resoldering may affect correct operation. Since 2009 relays have tamper proof seals fitted and once broken, warranty is void.

Most relay defects are caused by installation faults such as overvoltage, spikes/transients, reversed coil connection, high/short current far exceeding the relay specifications. When returning the relays for investigation, please provide all information on the RMA form. Send defective relays back to the manufacturer for repair or replacement. Normal wear and tear or external causes are excluded from warranty.

RMA procedure see www.morssmitt.com

Ordering scheme

MTDV4-U2 [ ] - [ ] [ ] / [ ] [ ] / [ ] Code [ ]

			Cannot be combined with:
Coil voltages	01N	Drop-out 15-60 VDC, pull-in 20-60 VDC	
	02N	Drop-out 30-120 VDC, pull-in 40-120 VDC	
	04N	Drop-out 45-180 VDC, pull-in 60-180 VDC	
	13N	Drop-out 60-240 VDC, pull-in 80-240 VDC	
	15N	Drop-out 75-300 VDC, pull-in 100-300 VDC	
Standard options (add as many options as needed)	E	Gold plated contacts	M
	K	Extra dust protection, IP50	
	Lr	Red LED indicator, standard	
	Q	Double zener diode	
	Y	Double make/ double break	
Special option (minimum order quantity: 20)	M	$AgSnO_2$ contacts, highly resistant to welding	E
Pull-in time delay / Drop-out time delay - Both fixed or 1 fixed and 1 adjustable	... s / ... s	Fixed: Any value between 0...60 s Adjustable: 0...3 s 0...6 s 0...10 s 0...30 s 0...60 s Remark: for standard applications delay-on and delay-off times minimal 0.5 s is recommended to avoid unwanted switching due to short voltage variations.	
Drop-out voltage / Pull-in voltage - Adjustable: don't mention voltage range in code - Fixed: mention drop-out / pull-in voltage - Special: Adjustable but preset in factory - For factory preset value put it between brackets ( ) - It can be one voltage or both Remark: both pull-in and drop-out voltages must be either adjustable or fixed	..... / .... VDC	See coil voltages	
Keying code		See table on page 10, leave blank for no keying	

Examples	Options	Pull-in time delay	Drop-out time delay	Drop-out voltage	Pull-in voltage	Keying
MTDV4-U201N-Lr 0.5s/0.5s		0.5 s fixed	0.5 s fixed	15-60 VDC adjustable	20-60 VDC adjustable	No keying
MTDV4-U202N-ELr 2s/1s 35/65 VDC code HU	Gold contacts	2 s fixed	1 s fixed	35 VDC fixed	65 VDC fixed	Code HU
MTDV4-U204N-LrQY 0-60s/12s 105/120 VDC code AV	Double zener diode Double make / double break	0-60s adjustable	12 s fixed	105 VDC fixed	120 VDC fixed	Code AV
MTDV4-U213N-Lr 3s/0-10s (130)/(150) VDC		3 s fixed	0-10 s adjustable	60-240 VDC adjustable Factory set on 130 VDC	80-240 VDC adjustable Factory set on 150 VDC	No keying

Over 11 million Mors Smitt relays in use in rail transport applications worldwide!

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