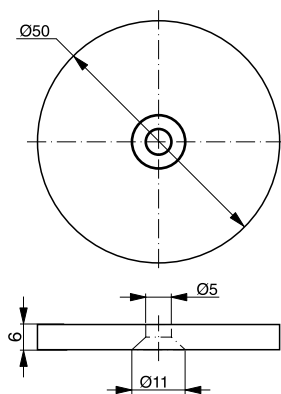
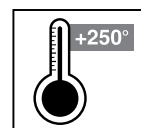


HF RFID SYSTEM TRANSPONDER RTP-0xx2-0x2

HOUSING	MEMORY SIZE	MOUNTING		
Ø 50 mm	128 Bytes 256 Bytes 2048 Bytes	Non-embeddable	<ul style="list-style-type: none"> ✓ Ultra high temperature HF transponder ✓ Housing with hole for fixing screw ✓ Insensitive to dirt ✓ Silicone free solution 	<ul style="list-style-type: none"> ✓ User memory ✓ User memory (EEPROM technology) ✓ Large usable memory (FRAM technology)



RTP-0502-0x2



TRANSPONDER	RTP-0502-022	RTP-0502-062	RTP-0502-082
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GENERAL DATA

Carrier frequency	13.56 MHz		
Max. transmission speed	53 kbit/s if fast custom commands are used, 26.5 kbit/s otherwise		
Type of integrated circuit	NXP ICODE SLI-S	Fujitsu MB89R118C	NXP ICODE SLI
Compatible standard	ISO 15693	ISO 15693 / ISO 18000-3 (Partly not supported. Refer to table "Note on Using MB89R118C" on page 8.)	ISO 15693
Memory type	EEPROM	FRAM	EEPROM
Memory size	256 Bytes	2 kBytes	128 Bytes
Read/write distance max. (with RLx-xxx-xxx and 10 mm spacer)	84 mm	50 mm	46 mm

MEMORY INFORMATION

Unique identifier	8 Bytes		
Organization	64 blocks × 4 Bytes	256 blocks × 8 Bytes	32 blocks × 4 Bytes
User memory (R/W)	40 blocks, 160 Bytes	250 blocks, 2000 Bytes	28 blocks, 112 Bytes
Configuration memory	24 blocks, 96 Bytes	6 blocks, 48 Bytes	4 blocks, 16 Bytes
Data retention period (< 55°C)	> 10 years	> 30 years	> 10 years
Number of "write" cycles	10 ⁵	10 ¹²	10 ⁵
Number of "read" cycles	unlimited		

MECHANICAL DATA

Protection degree	IP68 & IP69K
Ambient temperature range TA*	–25 ... +150°C
Storage temperature range TS**	–40 ... +250°C
Thermal cycling reliability @ 250°C	1000 cycles / 1000 hours
Housing material	LCP (Liquid Crystal Polymer)
Weight	16.9 g
Tightening torque	max. 1 Nm

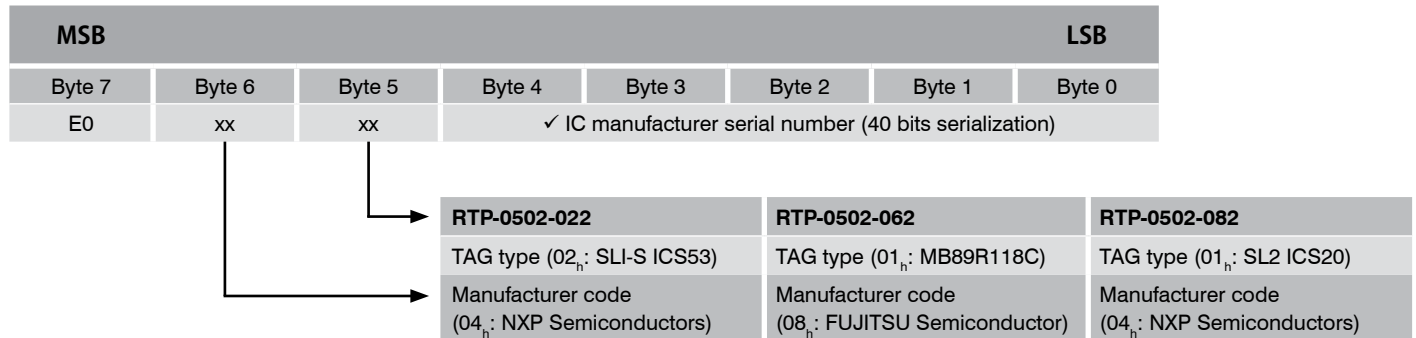
* Read/write operations possible

** Data retention and mechanical stability limit

UNIQUE IDENTIFICATION NUMBER (UID)

The 64-bits unique identification number (UID) is programmed during the production process according to ISO/IEC 15693-3 and cannot be changed afterwards. The type of TAG and manufacturer code are part of the UID: bytes 5 and 6 respectively.

Structure of memory block (RTP-0502-062: "FA_n" / RTP-0502-082: "FB_n" and "FC_n")

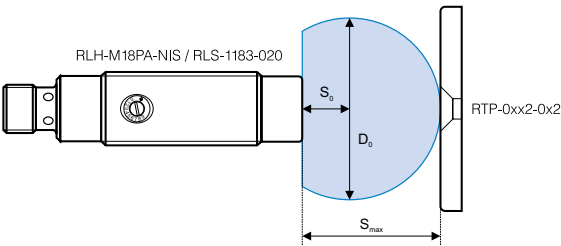


AVAILABLE TYPES

Part number	Part reference	Ø	Mounting
720-000-200	RTP-0502-022	50 mm	Non-embeddable
720-000-205	RTP-0502-062	50 mm	Non-embeddable
720-000-203	RTP-0502-082	50 mm	Non-embeddable

OPERATING ZONE

The operating area is highly dependent on the environment.



Typical values @ 25°C:

	RWM	S_{max} [mm]	S_0 [mm]	D_0 [mm]
RTP-0502-022	M18 (RSSI≤0)	34	10.5	44
	M18 (RSSI≤1)	34	10	42
	M30 (RSSI≤0)	56	27	58
	M30 (RSSI≤1)	50	23	54
	C44 (RSSI≤0)	84	44	84
	C44 (RSSI≤1)	78	41	80
RTP-0502-062	M18 (RSSI≤0)	20	4	39
	M18 (RSSI≤1)	20	4	39
	M30 (RSSI≤0)	50	23	56
	M30 (RSSI≤1)	46	20	52
	C44 (RSSI≤0)	50	23	56
	C44 (RSSI≤1)	46	20	52

MEMORY OF TRANSPONDERS

RTP-0502-022

The EEPROM has a memory capacity of 2,048 bits and is divided in two areas. One user area of 40 blocks and one system area of 24 blocks, that means a total of 64 blocks of 4 bytes each. The block is the smallest unit used to read and write the EEPROM memory.

EEPROM memory configuration

Area	Page No.	Block No.	Details	Read Access	Write Access
User memory (160 bytes)	00 _h to 09 _h	00 _h to 27 _h	User memory	✓	✓
System memory (96 bytes)	F0 _h to FE _h	E8 _h to FE _h	UID (64 bits), EPC Data, Access Control Info. Passwords AFI, DSFID, EAS Block security status	Inv. Cmd Get System Info Cmd EAS Cmd Get Multiple Block Security Status Cmd	Write AFI Cmd Write DSFID Cmd Write EAS Cmd Lock Block Cmd Lock DSFID Cmd Lock AFI Cmd (OTP)

User memory Direct read access to blocks of this memory is always possible. Direct write access to blocks of this memory is possible depending on the value of its corresponding block security status bit.

System memory Direct read or write access to blocks of this memory area is not possible.

Structure of a single user memory block

MSB			LSB	
Byte 3	Byte 2	Byte 1	Byte 1	Byte 0

RTP-0502-062

The FRAM has a memory capacity of 16,384 bits and is divided in two areas. One user area of 250 blocks and one system area of 6 blocks, that means a total of 256 blocks of 8 bytes each. The block is the smallest unit used to read and write the FRAM memory.

FRAM memory configuration

Area	Block No.	Details	Read Access	Write Access
User memory (2,000 bytes)	00 _h to F9 _h	User memory	✓	✓
System memory (48 bytes)	FA _h	UID (64 bits)	Inv. Cmd	×
	FB _h	AFI, DSFID, EAS, security status	Get System Info Cmd EAS Cmd	Write AFI Cmd Write DSFID Cmd Write EAS Cmd
	FC _h to FE _h	Block security status	Get Multiple Block Security Status Cmd	Lock Block Cmd (OTP)

User memory Direct read access to blocks of this memory is always possible. Direct write access to blocks of this memory is possible depending on the value of its corresponding block security status bit.

System memory Direct read or write access to blocks of this memory area is not possible.

Structure of a single user memory block

MSB				LSB			
Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0

RTP-0502-082

The EEPROM has a memory capacity of 1,024 bits and is divided in two areas. One user area of 28 blocks and one system area of 4 blocks, that means a total of 32 blocks of 4 bytes each. The block is the smallest unit used to read and write the EEPROM memory.

EEPROM memory configuration

Area	Block No.	Details	Read Access	Write Access
User memory (112 bytes)	00 _h to 1B _h	User memory	✓	✓
System memory (16 bytes)	FB _h & FC _h	UID (64 bits)	Inv. Cmd	×
	FD _h	AFI, DSFID, EAS	Get System Info Cmd EAS Cmd	Write AFI Cmd Write DSFID Cmd Write EAS Cmd
	FE _h	Block security status	Get Multiple Block Security Status Cmd	Lock Block Cmd Lock DSFID Cmd Lock AFI Cmd (OTP)

User memory Direct read access to blocks of this memory is always possible. Direct write access to blocks of this memory is possible depending on the value of its corresponding block security status bit.

System memory Direct read or write access to blocks of this memory area is not possible.

Structure of a single user memory block

MSB			LSB	
Byte 3	Byte 2	Byte 1	Byte 1	Byte 0

RTP-0502-022

Description

Unique identifier (UID) for each transponder
Lock mechanism for each user memory block (read and / or write protection)
Lock mechanism for DSFID, AFI and EAS*
Password (32-bits) protected memory management for Read access
Password (32-bits) protected memory management for Write access
Password (32-bits) protected transponder Destroy command
Password (32-bits) protected Privacy Mode
Password (32-bits) protected EAS functionality*
Initial state of the passwords 00000000 _h

* Features not available with Contrinex RWMs (RLx-xxxx-xxx)

RTP-0502-062

The security status of the user memory is stored in the block security status bit located in the system memory blocks "FC_h" to "FF_h".
A user memory is unlocked when the corresponding block security status bit is "0". It is locked (disable to write) when the corresponding block security status bit is "1".

The user memory, DSFID and AFI protections are OTP (one time programmable).

Structure of memory block "FC_h" to "FF_h"

Block No.	Block Security Status (BSS)																	
	MSB								LSB									
	Byte 7								Byte 6 to Byte 1		Byte 0							
FC _h	3F	3E	3D	3C	3B	3A	39	38	.....	3	2	1	0	FD ₃	02	01	00
FD _h	7F	7E	7D	7C	7B	7A	79	78	.....	47	46	45	44	43	42	41	40
FE _h	BF	BE	BD	BC	BB	BA	B9	B8	.....	87	86	85	84	83	82	81	80
FF _h	RFU (6 bits)						F9	F8	.....	C7	C6	C5	C4	C3	C2	C1	C0

RTP-0502-082

The security status of the user memory, DSFID and AFI identifier are stored in the block security status bit located in the system memory blocks "FE_h".

A user memory, DSFID, AFI and EAS are unlocked when the corresponding block security status bit is "0". It is locked (disable to write) when the corresponding block security status bit is "1". In block FD_h, each byte can be individually protected (e.g. FD₃ = FD_h block byte 3).

The user memory, DSFID, AFI and EAS protections are OTP (one time programmable).

Structure of memory block "FE_h"

Block No.	Block Security Status (BSS)																LSB			
	Byte 3								Byte 2 to Byte 1				Byte 0							
FE _h	1B	1A	19	18	17	16	15	14				03	02	01	00	FD ₃	FD ₂	FD ₁	FD ₀

SPECIAL FEATURES

RTP-0502-022	Name	Description
	EAS*	Electronic Article Surveillance
	AFI	Application Family Identifier
	DSFID	Data Storage Format Identifier
	EPC*	Electronic Product Code
	Destroy SLI-S	The data of the transponder are completely destroyed if the B9 command is preceded by the destroy password. The transponder will not answer any commands any more.
	Privacy Mode	In private mode, the transponder does not answer any more except to the command Get Random Number and Set Password.

AFI, DSFID, and EAS bits are written at the IC manufacturer factory, and can be updated and locked (disable to write) with specific commands. Only EAS bit cannot be locked. The LSB of Byte 7 holds the EAS bit. If the Electronic Article Surveillance is active (LSB = "1"), the transponder responds to an EAS command, otherwise it remains silent.

Structure of memory block "FB_n"

MSB			LSB		
Byte 7	Byte 6 to Byte 4	Byte 3	Byte 2	Byte 1	Byte 0
EAS Status*	RFU	DSFID Lock Status	AFI Lock Status	DSFID	AFI

The security status of the DSFID and AFI Identifier are stored in the Byte 3 and Byte 2 of the system memory blocks "FB_n" and are OTP (one time programmable).

AFI, DSFID, and EAS bits are written at the IC manufacturer factory, and can be updated and locked (disable to write) with specific commands. The LSB of Byte 1 holds the EAS bit. If the Electronic Article Surveillance is active (LSB = "1"), the transponder responds to an EAS Alarm command, otherwise it remains silent.

Structure of memory block "FD_n"

MSB			LSB
Byte 3	Byte 2	Byte 1	Byte 0
DSFID	AFI	EAS*	Internally used

* Features not available with Contrinex RWMs (RLx-xxxx-xxx)

LIST OF COMMANDS

	Command Name	Command Code	Description	Rxx-xxxx-		
				x20	320	NIS
Mandatory ISO 15693	Inventory	01 _n	Execute the anti-collision sequence and return UID	✓	✓	✗
	Stay Quiet	02 _n	Enter the Quiet state	✓	✗	✗
Optional ISO 15693	Read Single Block	20 _n	Read the requested 1 block data in the user/system memory	✓	✓	✓
	Write Single Block	21 _n	Write the requested 1 block data in the user memory	✓	✓	✓
	Lock Block	22 _n	Lock permanently the requested 1 block in the user memory	✓	✗	✗
	Read Multiple Blocks	23 _n	Read the requested n blocks data in the user memory	✗	✗	✗
	Write Multiple Blocks	24 _n	Write the requested n blocks data in the user memory	✗	✗	✗
	Select	25 _n	Enter the Select state	✓	✗	✗
	Reset to ready	26 _n	Enter the Ready state	✓	✗	✗
	Write AFI	27 _n	Write AFI (Application Family Identifier) value into EEPROM/FRAM	✓	✗	✗
	Lock AFI	28 _n	Lock permanently AFI value	✓	✗	✗
	Write DSFID	29 _n	Write DSFID (Data Storage Format Identifier) value into EEPROM/FRAM	✓	✗	✗
	Lock DSFID	2A _n	Lock permanently DSFID value	✓	✗	✗
	Get System Information	2B _n	Read the system information value (UID, DSFID, AFI, number of bytes per block, etc)	✓	✗	✓
	Get Multiple Block Security Status	2C _n	Read the block security status stored in system area	✗	✗	✗
	–	2D _n to 9F _n	Reserved for future use	–	✗	✗

LIST OF COMMANDS

	Command Name	Command Code	Description	Rxx-xxxx-		
				x20	320	NIS
Custom ISO 15693	RTP-0502-022					
	Set EAS	A2 _h	Set EAS bit to “1”	x	x	x
	Reset EAS	A3 _h	Set EAS bit to “0”	x	x	x
	Lock EAS	A4 _h	Lock permanently the EAS bit to its current value	x	x	x
	EAS Alarm	A5 _h	When EAS bit is “1”, reply 13 bytes of data (Flags, EAS, IC Mfg. code, UID and CRC16)	x	x	x
	Password Protect EAS	A6 _h	EAS Password has to be transmitted before with a Set Password command	x	x	x
	Write EAS ID	A7 _h	Write a new EAS identifier	x	x	x
	Read EPC	A8 _h	Read the EPC data stored into the system memory	x	x	x
	Inventory Page Read	B0 _h	Execute the anti-collision sequence and return the requested n page data in the user memory	x	x	x
	Fast Inventory Page Read	B1 _h	Fast response Inventory Page Read command	x	x	x
	Get Random Number	B2 _h	Get a random number calculated in the transponder	✓	x	✓
	Set Password	B3 _h	Get access to the different protected functionalities in function of the password identifier used	✓	x	✓
	Write Password	B4 _h	Write a new password into the transponder system memory in function of the password identifier used	✓	x	x
	Lock Password	B5 _h	Lock permanently one password in function of the password identifier used	✓	x	x
	Protect Page	B6 _h	Set the read and write access condition pagewise	✓	x	x
	Lock Page Protection	B7 _h	Lock permanently the read and write access condition pagewise	✓	x	x
	Get Multiple Block Protection Status	B8 _h	Read the block security status stored of the requested n blocks	✓	x	x
	Destroy SLI-S	B9 _h	Destroy permanently the transponder ISO 15693 air interface	✓	x	x
	Enable Privacy	BA _h	Enable the SLI-S privacy mode	x	x	x
	64 Bit Password Protection	BB _h	If 64-Bit Password Protection is enabled both read + write passwords are required to access read and write protected blocks (pages)	✓	x	x
Custom ISO EPC HF*	Begin Round	30 _h	Execute the anti-collision sequence and return EPC	x	x	x
	Write Block	01 _h	Write new EPC data into the transponder memory	x	x	x
	Destroy	02 _h	Destroy permanently the transponder EPC HF air interface	x	x	x

* Refer to "13.56MHz ISM Band Class 1 Radio Frequency (RF) Identification Tag Interface Specification" for more details

LIST OF COMMANDS

	Command Name	Command Code	Description	Rxx-xxxx-		
				x20	320	NIS
Custom ISO 15693	RTP-0502-062					
	EAS	A0 _h	When EAS bit is “1”, reply response code 6 times	x	x	x
	Write EAS	A1 _h	Write EAS data (1 bit). Data “1” validates anti-theft/goods-monitoring. Data “0” invalidates them	x	x	x
	Read Multiple Blocks Unlimited	A5 _h	Read the specified data of up to 256 blocks in the user/system memory at once	x	x	x
	Fast Inventory	B1 _h	Fast response Inventory command	x	x	x
	Fast Read Single Block	C0 _h	Fast response Read Single Block command	x	x	x
	Fast Write Single Block	C1 _h	Fast response Write Single Block command	x	x	x
	Fast Read Multiple Blocks	C3 _h	Fast response Read Multiple Blocks command	x	x	x
	Fast Write Multiple Blocks	C4 _h	Fast response Write Multiple Blocks command	x	x	x
	Fast Write EAS	D1 _h	Fast response Write EAS command	x	x	x
	Fast Read Multiple Blocks Unlimited	D5 _h	Fast response Read Multiple Blocks Unlimited command	x	x	x
	RTP-0502-082					
	Inventory Read	A0 _h	Execute the anti-collision sequence and return the requested n blocks data in the user memory	x	x	x
	Fast Inventory	A1 _h	Fast response Inventory command	x	x	x
	Set EAS	A2 _h	Set EAS bit to “1”	x	x	x
	Reset EAS	A3 _h	Set EAS bit to “0”	x	x	x
	Lock EAS	A4 _h	Lock permanently the EAS bit to its current value	x	x	x
	EAS Alarm	A5 _h	When EAS bit is “1”, reply 13 bytes of data (Flags, EAS, IC Mfg. code, UID and CRC16)	x	x	x

NOTES ON USING MB89R118C

Parameter	ISO/IEC 15693 Specification	MB89R118C
Data coding	1 out of 256	No correspondence
Subcarrier	2-subcarrier	No correspondence
Optional command	Read Multiple Blocks command	Correspondence up to 2 blocks
	Write Multiple Blocks command	Correspondence up to 2 blocks

The above table presents the discrepancies between the IC MB89R118C and the ISO/IEC 15693 standard.