Lucy Electric

Gemini 3 Mini Remote Terminal Unit

engineering intelligent solutions

Lucy Electric's complete range of automated power distribution products gives customers a choice of automation building blocks which can be tailored to offer a complete smart grid solution.

At the cutting edge of medium voltage switchgear design for both ground and pole-mounted switchgear, the products offer an innovative systems-engineered approach to smart grid solutions.

Introduction to Gemini 3 Mini RTU

The Gemini 3 Mini RTU is part of the Gemini 3 Platform providing advanced monitoring and control for medium voltage switchgear. Switch control is achieved locally with the HMI module (common to the Gemini 3 Modular family), via hard-wired inputs, or remotely over a communication link.

The Gemini 3 Mini RTU is DIN rail mounted providing the optimum suitability and footprint for controlling overhead and ground mount switchgear. The Gemini 3 Mini RTU comprises up to three factory fitted sub-assemblies which can control up three switches. This can be expanded up to 24 switch control with the addition of Expansion Units

Features and benefits:

- Low power consumption saving costs in power supplies
- Dedicated motor power enable relay output providing safe and secure operation of switchgear
- Secure control operations
- Optional HMI via CAN bus port
- I/O expansion via CAN bus expansion port
- I/O expansion and analogue inputs via Modbus port
- I/O have associated LED indicators
- Digital inputs capable of using volt-free contacts avoiding need for providing a wetting voltage
- Capabilities for battery back-up supported
- Flexible communication options
- Enhanced cyber security features for use in Critical National Infrastructure
- Supports multiple masters
- Simple DIN rail mounting, saving time and simplifying maintenance
- Optimised form factor providing efficient assembly into control cabinets and switchgear panels
- Easy to configure, customisable product adapting to different solutions
- Pluggable terminal blocks improving installation times
- Secure firmware and configuration
- IEC 61499 programmable logic
  - Event driven
  - Hierarchical
  - Distributed processing
  - Standard library functions available
  - IEC 61131-3 supported
- Pre-assigned I/O allocation available for fast and easy solutions
- Simple parameter changes in configuration tool allowing customisation

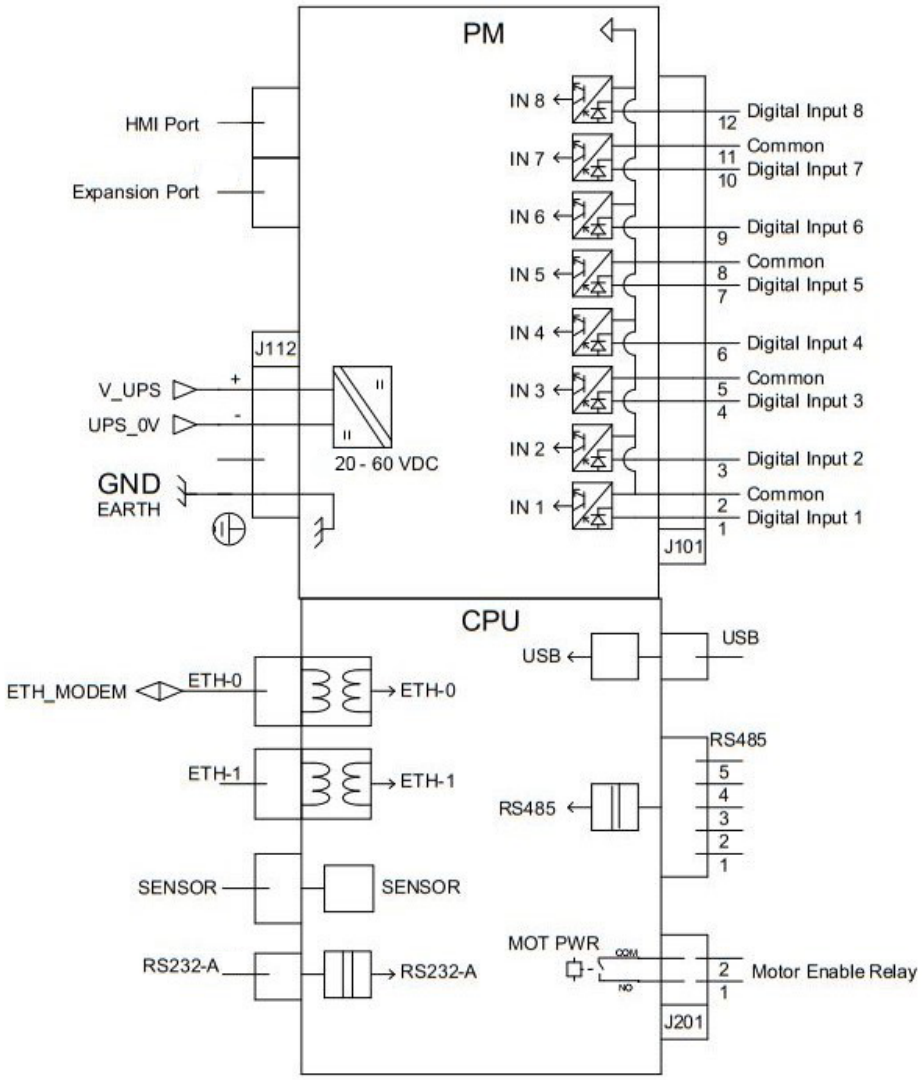
Applications:

- Overhead switch monitoring and control
- Ring main unit monitoring and control
- Automatic transfer of source (ATS) schemes
- Automatic sectionalising
- Centralised self-healing network applications
- Can be used in voltage control applications

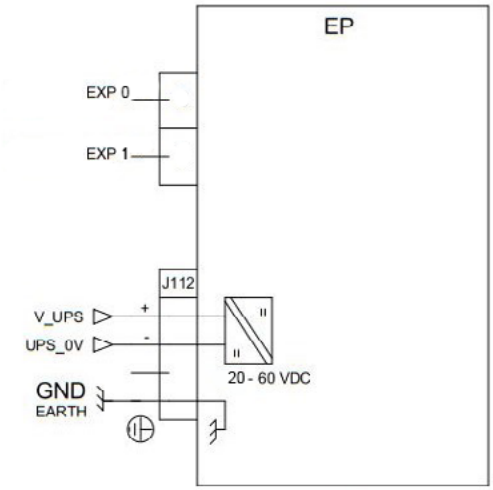
Gemini 3 Mini overview

The Gemini 3 Mini RTU comprises up to 3 sub-assemblies, each sub-assembly being Switch (SW), Digital Input / Output (DIO) or Digital Input (DI). Additional I/O can be added to the RTU with Expansion Units . Each Expansion Unit can comprise up to 3 sub-assemblies.

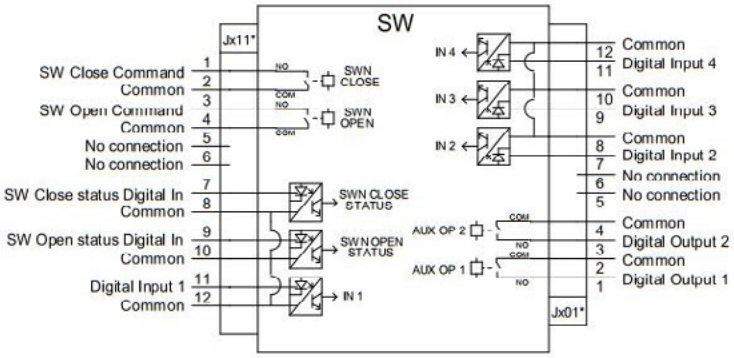
Power Management and CPU sub-assembly



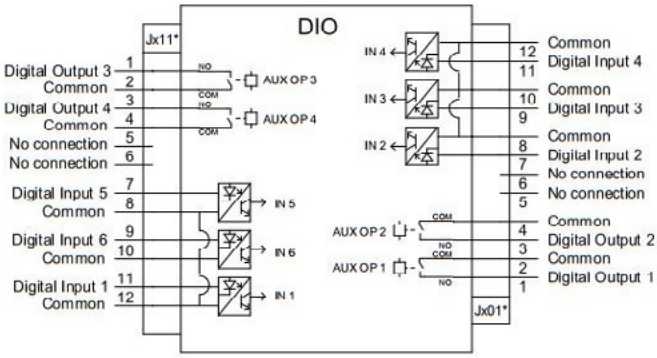
Expansion processor



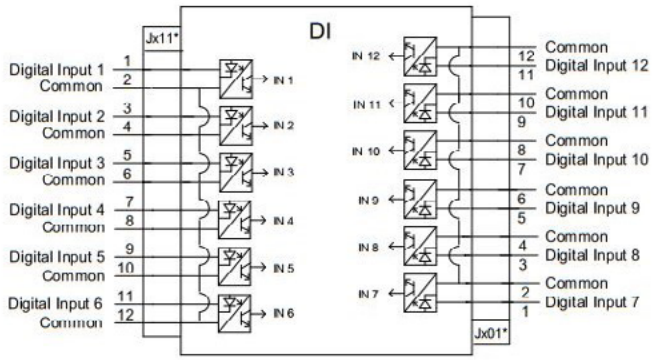
Switch sub-assembly



Digital input/ output sub-assembly

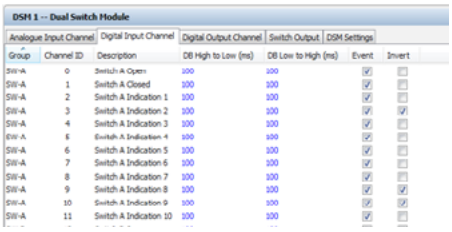


Digital input sub-assembly



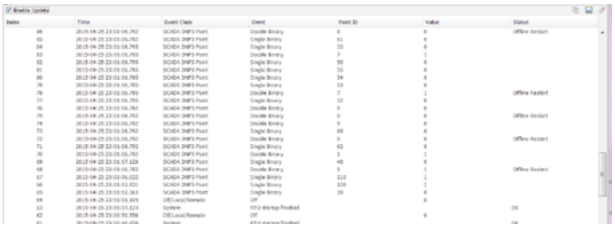
Gemini 3 Mini RTU overview

Digital Inputs



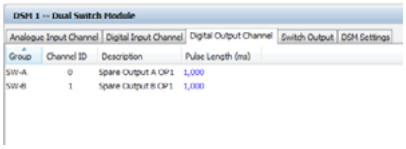
All control digital inputs are galvanic isolated using an optical coupler, and user-configurable (assignable, can be inverted, de-bounce timer) using the Gemini 3 configuration and commissioning tool. An isolated 12 V wetting voltage is provided internally to power the optically-isolated digital inputs from external volt-free contacts. All digital inputs have associated LEDs to indicate input status.

Alarms and Events



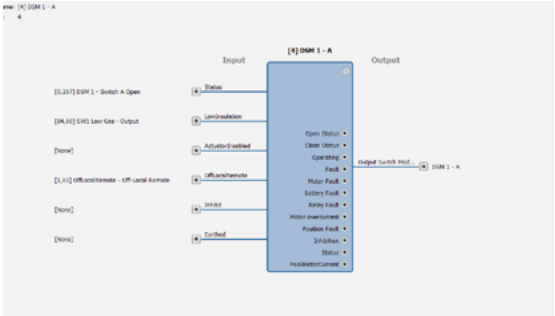
14,000 events (1 ms resolution) are stored in non-volatile memory. Alarms and event logs are available locally (via the optional HMI) or remotely via the SCADA communications. Alarms and event logs are also available via the Gemini 3 configuration and commissioning software. Gemini 3 Mini has a real-time clock with synchronisation available via NTP, GPS and the SCADA protocol.

Digital Outputs



RTU output contacts are user-configurable (assignable, pulse length) using the Gemini 3 configuration and commissioning tool. All output contacts are volt-free, rated at 30 VDC, with 1 A fuse protection, and isolated from the RTU electronics. This control can be operated from the Gemini 3 configuration and commissioning tool, local HMI or from the SCADA. The status of all outputs is indicated by LED.

Automation Schemes



The Gemini 3 Mini RTU supports IEC 61499 programmable logic. This is an event driven, hierarchical programming language, based on Function Blocks supporting centralised and distributed processing of fault detection, isolation and restoration. Standard library functions are available such as automatic source change-over and automatic sectionalising schemes.

IEC 61131 is supported through the encapsulation of the algorithm in the IEC 61499 Function Block.

Gemini 3 Mini RTU overview

Gemini 3 Mini RTU

The Gemini 3 Mini RTU comprises a Power Module, CPU sub-assembly, and up the three SW, DI or DIO sub-assemblies. Additional I/O can be added using Expansion Units.

Power Module & CPU sub-assembly

The Power Module and CPU sub-assemblies form the Gemini 3 Mini RTU; providing central control and supervision for all sub-assemblies and handling of the protocol communications. This is the minimum configuration of the Gemini 3 Mini RTU providing 8 digital inputs and 1 digital output. When combined with SW sub-assemblies this digital output becomes a dedicated motor power control output with LED indication to enable the motor supply, thereby ensuring a safe and secure operation. There is also a special control indication (dummy control) which illuminates an LED to prove that the communication system is working.

SW sub-assembly

The Switch sub-assembly (SW) has 6 digital inputs and 4 digital outputs. Two sets of inputs and outputs are dedicated for switch control and not freely configurable by the user. These have been specifically pre-assigned and combined with control logic for safe and secure operation of switchgear.

DI sub-assembly

The Digital Input sub-assembly (DI) comprises of 12 isolated digital inputs. These inputs are all user-configurable.

DIO sub-assembly

The Digital Input / Output sub-assembly (DIO) is a variant of Switch sub-assembly (SW) wherein all I/O are freely configurable by user. This provides 6 freely configurable digital inputs and 4 freely configurable digital outputs.

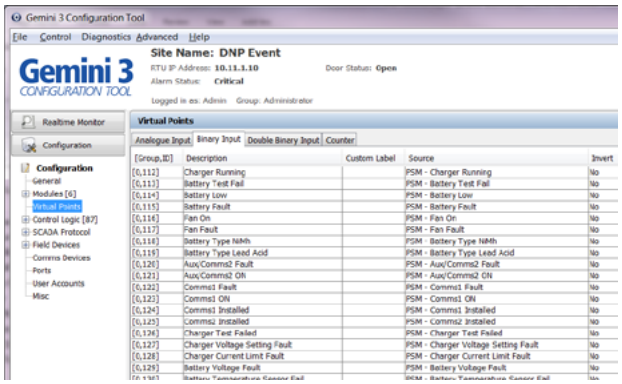
Expansion unit

The Expansion Unit comprises an Expansion Processor (EP) accommodating up to 3 more sub-assemblies (DI, DIO, SW). A total of 7 Expansion Units can be added

AMM

The Analogue Input Module (AMM) is part of the Gemini 3 platform; it provides advanced measurement and directional fault detection and supports automatic control functions. More details are available in the AMM data sheet.

Gemini 3 Mini RTU overview



Configuration and commissioning

The Gemini 3 Mini RTU uses the same configuration and commissioning tool as the Gemini 3 Modular RTU. The Gemini 3 configuration and commissioning tool is aimed to minimise training and also supports configuration and commissioning wizards.

Security compliance

The Gemini 3 Mini RTU has been designed to be a secure element of a distribution automation system and has undergone extensive security testing, both in house and with external organisations. The Gemini 3 Mini RTU uses a number of techniques to eliminate security vulnerabilities including:

- Stateful packet inspection firewall
- Service and port restriction
- Multi-layered access controls
- Role based authentication and authorisation

We are constantly reviewing product security and keep a close watch on new threats and attack vectors. As appropriate Lucy Electric will respond to identified risks and enhance the security of our products.

Power supply requirements

The Power Module and Expansion Processor can be powered from a stable DC supply in the range 20-60 VDC, 6 W. The RTU provides a dedicated output which can enable a motor power relay, providing an additional interlock for secure operation of electrical plant.

HMI, communications and communication protocols

The following communications ports are provided:

- Dual isolated Ethernet ports, for TCP / IP and VPN connections
- Isolated RS232 port, for serial data transmission, 9 Pin D Type connector
- Isolated RS485 port, for serial data transmission
- USB port
- CAN bus port for Gemini 3 HMI
- CAN bus port for future expansion
- Temperature sensor input via I2C (range -40˚C to150˚C)

Gemini 3 Mini RTU overview

HMI, Communications and Communication Protocols

The Gemini 3 Mini supports the standard HMI common to the Gemini 3 platform. The HMI is an optional module that allows local control and monitoring of the Gemini 3 Mini RTU without the need for the Gemini 3 configuration and commissioning tool or SCADA.

Slave: DNP 3.0 serial and TCP, IEC 60870-5-101, IEC 60870-5-104. This is for SCADA communications, and multiple masters are supported.

CAN bus

Local / Remote Indication

Three operation modes are available; control capability off, local and remote. The status of these operating modes is indicated by LEDs, and can be communicated to the SCADA. These operating modes can be switched using the Gemini 3 HMI option. Binary inputs can also be configured to provide off / local/ remote as an alternative to the HMI.

Master: Modbus RTU and TCP. This is for integrating IED slave devices such as power meters and protection relays into the Gemini 3 Mini RTU and can be presented to the SCADA. DNP 3.0 master is also available.

Inputs, Outputs and LED Indications

	RTU	SW	DIO	DI	EP
LED's	Power RTU OK CAN bus OK Dummy Switch				Power RTU OK CAN bus OK
Inputs/ LED's	Input 1 Input 2 Input 3 Input 4 Input 5 Input 6 Input 7 Input 8	Switch Open input Switch Closed input Switch input 1 Switch input 2 Switch input 3 Switch input 4	Input 1 Input 2 Input 3 Input 4 Input 5 Input 6	Input 1 Input 2 Input 3 Input 4 Input 5 Input 6 Input 7 Input 8 Input 9 Input 10 Input 11 Input 12	
Outputs/ LED's	Motor enable relay	Switch open command Switch close command Output 1 Output 2	Output 1 Output 2 Output 3 Output 4		
Connectors	1 x 12-pin pluggable connector 12 AWG 1 x 4-pin pluggable connector 12 AWG 2 x RJ12 connectors 1 x 2-pin pluggable connectors 12 AWG 1 x 5-pin pluggable connectors 16 AWG 2 x RJ45 connectors 1 x 9-pin DB9 1 x USB 12C input (for temperature)	2 x 12-pin pluggable connectors 12 AWG	2 x 12-pin pluggable connectors 12 AWG	2 x 12-pin pluggable connectors 12 AWG	1 x 4-pin pluggable connector 12 AWG 2x RJ12 connectors

Dimensions and Mounting

Gemini 3 Mini RTU

	0-switch	1-switch	2-switch	3-switch
Height	106 mm	106 mm	106 mm	106 mm
Width	55 mm	84 mm	109 mm	133 mm
Depth	120 mm	120 mm	120 mm	120 mm
Weight	315 g	450 g	590 g	725 g
Method of mounting	35 mm DIN rail mounting			
IP Rating	IP20			

Gemini 3 Mini Expansion Processor

	1-switch	2-switch	3-switch
Height	106 mm	106 mm	106 mm
Width	55 mm	84 mm	109 mm
Depth	120 mm	120 mm	120 mm
Weight	315 g	450 g	590 g
Method of mounting	35 mm DIN rail mounting		
IP Rating	IP20		

AMM

	AMM
Height	106 mm
Width	55 mm
Depth	120 mm
Weight	315 g
Method of mounting	35 mm DIN rail mounting
IP Rating	IP20

Technical Data

Atmospheric Environment

Test	Standard	Description
Cold test operation	IEC 60068-2-1	-25°C for 96 hours
Cold test storage	IEC 60068-2-1	-25°C ±3°C for 96 hours
Dry heat test operation	IEC 60068-2-2	+70°C ±2°C for 96 hours
Dry heat test storage	IEC 60068-2-2	+70°C ±2°C for 96 hours
Cyclic temperature	IEC 60068-2-14	-25°C, +70˚C, 5 cycles, dwell time 3 hours
Damp heat steady state	IEC 60068-2-78	+40 °C, 93% RH, 4 days
Damp heat, cyclic	IEC 60068-2-30	+55°C, 95% RH, 6 of 24 h cycles
Ingress protection	IEC 60529	IP 20 RTU Electronics

Mechanical Environment

Test	Standard	Description
Vibration test	IEC 60255-21-1	Response Class 1, Endurance Class 1
Shock	IEC 60255-21-2	Response Class 1, Endurance Class 1
Bump	IEC 60255-21-2	Class 1
Seismic	IEC 60255-21-3	Class 1

Electrical Environment

Test	Standard	Description
Insulation – dielectric	IEC 60255-27	Power supply port, input/output ports, functional earth port, 2kV, 1 minute For comm. ports 0.5kV, 1 minute
Insulation – impulse voltage	IEC 60255-27	Power supply port, input/output ports, functional earth port, 5 kV peak, 1.2/50 µs, 0.5 J For comm. ports, 1kV peak, 1.2/50 µs, 0.5 J
Insulation - insulation resistance	IEC 60255-27	Power supply port, input/output ports, functional earth port, > 100 MΩ at 500 V d.c.

EMC Tests

Test	Standard	Description
Electrostatic discharge immunity	IEC 60255-26, IEC 61000-4-2	Level 3
Radiated, radio-frequency, electromagnetic field immunity	IEC 60255-26, IEC 61000-4-3	Level 3
Fast transient immunity	IEC 60255-26, IEC 61000-4-4	Level 4
Surge immunity	IEC 60255-26, IEC 61000-4-5	Level 4
Conducted disturbance induced by RF fields	IEC 60255-26, IEC 61000-4-6	Level 3
Power frequency magnetic field immunity	IEC 60255-26, IEC 61000-4-8	Level 4
Pulse magnetic field immunity	IEC 61000-4-9	Level 5
Damped oscillatory magnetic field immunity	IEC 61000-4-10	Level 5
Ripple on d.c. input power port immunity	IEC 60255-26, IEC 61000-4-17	Level 4
Damped oscillatory wave immunity test - Slow	IEC 60255-26, IEC 61000-4-18	Level 3
Damped oscillatory wave immunity test - Fast	IEC 61000-4-18	Level 4
Radiated emission (below 1 GHz)	IEC 60255-26, EN 55011, CISPR 11	Class A
Radiated emission (above 1 GHz)	IEC 60255-26, EN 55011, CISPR 22	Class A
Conducted emission	IEC 60255-26, EN 55011, CISPR 22	Class A

Detailed reports can be made available upon request.

Ordering Options

Gemini 3 Mini RTU

Order code	Description	Gemini 3 Mini RTU					Digital Inputs	Digital Outputs
AUT0003522	Gemini 3 Mini -/-/-	PM	CPU				8	1
AUT0002440	Gemini 3 Mini SW/-/-	PM	CPU	SW			14	5
AUT0003503	Gemini 3 Mini SW/SW/-	PM	CPU	SW	SW		20	9
AUT0002442	Gemini 3 Mini SW/SW/SW	PM	CPU	SW	SW	SW	26	13
AUT0003748	Gemini 3 Mini DIO/-/-	PM	CPU	DIO			14	5
AUT0003750	Gemini 3 Mini DI/-/-	PM	CPU	DI			20	1
AUT0003752	Gemini 3 Mini SW/DIO/-	PM	CPU	SW	DIO		20	9
AUT0003753	Gemini 3 Mini SW/DI/-	PM	CPU	SW	DI		26	5
AUT0003755	Gemini 3 Mini DIO/DIO/-	PM	CPU	DIO	DIO		20	9
AUT0003756	Gemini 3 Mini DIO/DI/-	PM	CPU	DIO	DI		26	5
AUT0003759	Gemini 3 Mini DI/DI/-	PM	CPU	DI	DI		32	1
AUT0003726	Gemini 3 Mini SW/SW/DIO	PM	CPU	SW	SW	DIO	26	13
AUT0003727	Gemini 3 Mini SW/SW/DI	PM	CPU	SW	SW	DI	32	9
AUT0003729	Gemini 3 Mini SW/DIO/DIO	PM	CPU	SW	DIO	DIO	26	13
AUT0003730	Gemini 3 Mini SW/DIO/DI	PM	CPU	SW	DIO	DI	32	9
AUT0003732	Gemini 3 Mini SW/DI/DI	PM	CPU	SW	DI	DI	38	5
AUT0003735	Gemini 3 Mini DIO/DIO/DIO	PM	CPU	DIO	DIO	DIO	26	13
AUT0003736	Gemini 3 Mini DIO/DIO/DI	PM	CPU	DIO	DIO	DI	32	9
AUT0003738	Gemini 3 Mini DIO/DI/DI	PM	CPU	DIO	DI	DI	38	5
AUT0003741	Gemini 3 Mini DI/DI/DI	PM	CPU	DI	DI	DI	44	1

All above are with DNP 3.0 slave and default configuration.
Please specify with the order if IEC 60870-5-104 is required.

Gemini 3 Mini Expansion Unit

Order code	Description	Gemini 3 Mini Expansion Unit				Digital Inputs	Digital Outputs
AUT0003764	Gemini 3 Mini EU SW/-/-	EP	SW			6	4
AUT0003772	Gemini 3 Mini EU DIO/-/-	EP	DIO			6	4
AUT0003773	Gemini 3 Mini EU DI/-/-	EP	DI			12	0
AUT0003778	Gemini 3 Mini EU SW/SW/-	EP	SW	SW		12	8
AUT0003779	Gemini 3 Mini EU SW/DIO/-	EP	SW	DIO		12	8
AUT0003780	Gemini 3 Mini EU SW/DI/-	EP	SW	DI		18	4
AUT0003782	Gemini 3 Mini EU DIO/DIO/-	EP	DIO	DIO		12	8
AUT0003783	Gemini 3 Mini EU DIO/DI/-	EP	DIO	DI		18	4
AUT0003785	Gemini 3 Mini EU DI/DI/-	EP	DI	DI		24	0
AUT0003672	Gemini 3 Mini EU SW/SW/SW	EP	SW	SW	SW	18	12
AUT0003788	Gemini 3 Mini EU SW/SW/DIO	EP	SW	SW	DIO	18	12
AUT0003789	Gemini 3 Mini EU SW/SW/DI	EP	SW	SW	DI	24	8
AUT0003791	Gemini 3 Mini EU SW/DIO/DIO	EP	SW	DIO	DIO	18	12
AUT0003792	Gemini 3 Mini EU SW/DIO/DI	EP	SW	DIO	DI	24	8
AUT0003794	Gemini 3 Mini EU SW/DI/DI	EP	SW	DI	DI	30	4
AUT0003797	Gemini 3 Mini EU DIO/DIO/DIO	EP	DIO	DIO	DIO	18	12
AUT0003798	Gemini 3 Mini EU DIO/DIO/DI	EP	DIO	DIO	DI	24	8
AUT0003800	Gemini 3 Mini EU DIO/DI/DI	EP	DIO	DI	DI	30	4
AUT0003803	Gemini 3 Mini EU DI/DI/DI	EP	DI	DI	DI	36	0

Gemini 3 Mini Accessories

Order code	Description
AUT0000037	Gemini 3 HMI
AUT0003408	Gemini 3 Mini HMI cable
AMM	See AMM data sheet
AUT0003902	Temperature sensor

For complete RTU solutions please contact your local sales representative

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