

REASON DR60

Digital Recorder and PMU

The Reason DR60 is a centralized one-box multifunctional digital fault recorder (DFR). The small form factor, together with the ruggedness of design drawn from field experience in yard-mounted applications, ensures that the Reason DR60 can be installed in harsh utility and industrial environments. The high scalability in binary I/O counts along with modern communications such as IEC61850 Edition 2 and synchronization protocols such as MMS, GOOSE and PTP precision-timing, place the DR60 at the forefront of digital fault recording technology.

Full system awareness

The DR60 outstanding performance, high accuracy and complete set of functionalities provide data for several applications and analysis, such as:

- Fault Recorder (waveform and binary status);
- Disturbance Recorder;
- Sequence of Events Recorder (COMFEDE);
- Long-term trends Recorder;
- Revenue readings
- Asset Management

IEC 61850, born and bred

Born with IEC 61850 spirit, this is the DR60 motto. That means all its internal functions are implemented and mapped according to IEC 61850 ed.2 logical nodes and data models. Even its configuration is performed using native SCL files. It features MMS report control blocks for communication with supervisory systems and GOOSE publisher and subscriber for interaction with other IEDs through the IEC 61850 process bus.

Substation Protocols and Standards

The DR60 Digital Recorder offers what is best for high-quality measurements, synchronization, communication, and security. To do so, the DR60 utilizes well-recognized protocols for time synchronization and communication, such as: IEEE1588v2, MMS and GOOSE. The DR60 is full compliant with NERC CIP-5 and integration with Internet of Things (IoT) through Predix applications are scheduled for future firmware releases.

Ready for today's and tomorrow's substations

The DR60 is a modern and flexible solution that meets current and future application requirements granting the best that the IEC61850 has to offer to the customer's installations.



Situational Awareness

- Waveform recorder supporting 256 and 512 samples per cycle
- Disturbance and continuous disturbance recorder
- Trend Recorder & sequence of events recorder
- PMU IEEE C37.118.1/2-2011/1a-2014 compliance

High Density I/O

- Up to 32 analog inputs
- Up to 96 binary inputs and up to 48 binary outputs
- Up to 32 high-speed transducer inputs for HVDC applications

Communications

- Supporting industry standard protocols including DNP3, MMS and GOOSE
- Time synchronization including support for IEEE 1588 PTPv2 and IRIGB
- Serial (RS232 and Ethernet (RJ45 or LC) interfaces

Application Flexibility

- Cross triggering
- Trigger matrix for easy output configuration and special logic schemes
- Native configuration in SCL format
- MMS report control blocks
- Back and front panel mounting

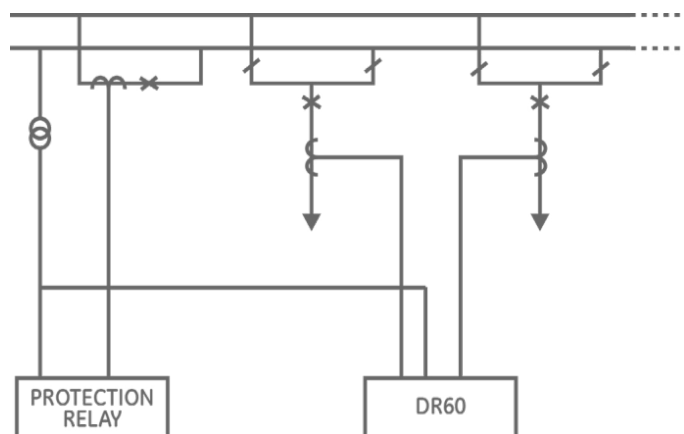


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Phasor Measurement Unit (PMU)

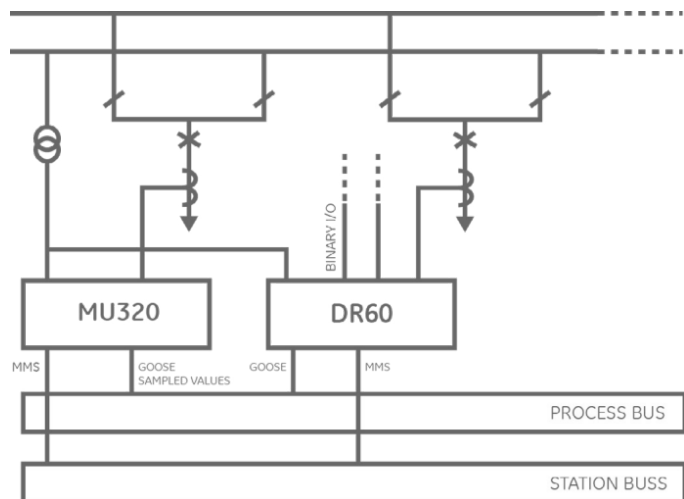
The DR60 provides powerful and cost-effective synchrophasor measurement solution according to IEEE C37.118.1/2- 2011/1a-2014 standard and is capable of transmitting its data in up to 4 separate data streams. Each stream can be configurable independently based on: contents; frame rate; Class of service (P or M) and communication mode (TCP or UDP).

DR60 architecture example: DFR-Monitoring-PMU



The DR60 can be installed to monitor and record analog and binary signals. Depending on the part number option, with a single DR60 it is possible to have: up to 32 analog inputs; up to 96 binary inputs; up to 32 high-speed transducer inputs for HVDC or up to 48 binary outputs.

DR60 architecture example: Extension I/O BOX



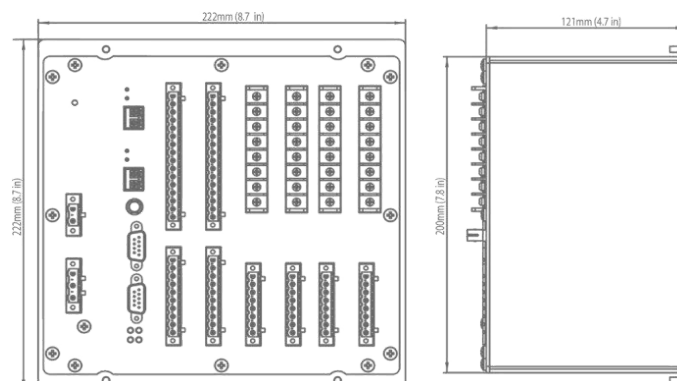
The DR60 can be used to translate the analog and binary signals into IEC 61850 standard protocol as GOOSE and MMS.

DC transducer inputs specifications

CHARACTERISTIC	VOLTAGE TRANSDUCER INPUT	CURRENT TRANSDUCER INPUT
Measurement range	- 12.5 to + 12.5 V	- 25 to 25 mA
Accuracy	± 0.1 % of FS	± 0.1 % of FS
Impedance	>5 kΩ	10 Ω

Dimensions of the equipment

Height	222 mm / 8.7 in (5 U)
Width	222 mm / 8.7 in (½ 19")
Depth	121 mm / 4.7 in
Weight	< 3.5 kg (< 7.72 lb)



Ethernet ports

TYPE	ELECTRICAL	OPTICAL
Use	Configuration, monitoring, communication, software upgrade, log download	
Interface	10BASE-T / 100BASE-TX	100BASE-FX
Bit Rate	10 / 100 Mbps	100 Mbps
Connector	RJ 45	LC
Fiber type	---	Multimode 62.5 / 125 μm 50 / 125 μm
Wavelength	---	1300 nm
Emission power	---	-20 dBm
Sensitivity	---	-32 dBm
Maximum applicable power	---	-14 dBm
Isolation Level	1.44 kVdc	---
Possible Redundancy	Failover or PRP	

Serial port

Interface	RS232
Use	Device configuration, change password, license upgrade and DNP3
Bitrate	115200 bps
Databits	7 or 8
Stopbits	1 or 2
Parity	None, even, odd
Connector	DB9 (female), standard DTE

IRIG-B optical port

Signal	IRIG-B004
Wavelength	820 nm
Fiber type	Multimode 62.5 / 125 µm or 50 / 125µm
Connector	ST
Sensitivity	- 24 dBm

Binary inputs specifications B1 and B2 (HW-A)

Nominal Voltage	125 / 250 Vdc	24 / 48 Vdc
Level Low	65 V	8 V
Level High	91 V	13 V
Impedance	120 kΩ	14 kΩ
Burden (Vn)	< 0.14W@125V < 0.65W@250V	< 0.06W@24V < 0.18W@48V
Continuous Overload ¹	300 V	100 V
Acquisition sampling rate	256 and 512 spc	

Binary inputs specifications B3 and B4 (HW-B)

Nominal Voltage	24 V	48 V	125 V	250 V
Level Low	08 V	10V	40 V	75 V
Level High	17 V	19V	85 V	160 V
Impedance	15kΩ	16kΩ	82 kΩ	164 kΩ
Burden (Vn)	< 0.05 W	< 0.2 W	< 0.25 W	< 0.5 W
Continuous Overload ¹	50 V	100 V	170 V	340 V
Acquisition sampling rate	256 and 512 spc			

Binary outputs

Type	B2	B4
Description	Dry contact relay, normally open	
Switching Voltage	250 V (AC and DC)	
Maximum continuous current	3 A	5 A
Maximum voltage	300 (AC and DC)	
Making Capacity	15 A, 4 sec	
Breaking Capacity	40 W Resistive 25 W/VA L/R = 50	
Operation time	< 5 ms	
Dropout time	< 15 ms	
Withstand voltages across open contacts	1000 Vrms	
Permissible short time value for 1s	30 A	

IN SERVICE contact specifications

Description	Dry contact relay, normally closed
Switching Voltage	250 V (AC and DC)
Permissible current continuous	5 A
Maximum voltage	300 (AC and DC)
Making Capacity	15 A, 4 sec
Breaking Capacity	40 W Resistive, 25 W/VA L/R = 50
Dropout time	< 5 ms
Withstand voltages across open contacts	1000 Vrms
Permissible short time value for 1s	30A

Voltage inputs specifications (50/60 Hz)

CHARACTERISTIC	STANDARD INPUT	HIGH ACCURACY INPUTS
Nominal Voltage (V_n)	115 V	115 V
Voltage range RMS	0.25-460 V	0.11-230 V
Analog Input Accuracy	Class 0.5 (IEC 61869-2)	Class 0.1 (IEC 61869-2)
Burden v_n	< 0.1 VA	< 0.1 VA
Continuous Overload	230 V ($2 \times V_n$)	230 V ($2 \times V_n$)
Maximum Overload (1s)	460 V ($4 \times V_n$)	460 V ($4 \times V_n$)
Input isolation	> 3,5 kV	> 3,5 kV

Current inputs specifications (50/60 Hz)

CHARACTERISTIC	STANDARD INPUT (P1)	STANDARD INPUT (P5)	HIGH ACCURACY INPUTS (ME)
Nominal Current (I_n)	1 A	5 A	1 and 5 A
Current range	0.02... 40 A	0.1... 200 A	0.005... 10 A
Analog Input Accuracy	Class 0.5 (IEC 61869-2) ¹ 0,05In to 40In better than 0,1% of the measurement $\pm 2\text{mA}$ <0,1% of full scale	Class 0.5 (IEC 61869-2) ¹ 0,05In to 0,2In better than 0,15% of the measurement $\pm 5\text{mA}$ 0,2In to 0,5In better than 0,1% $\pm 2\text{mA}$ of measurement 0,5In to 40In better than 0,1% of measurement <0,1% of full scale	Class 0.1 (IEC 61869-2) ¹ 0,05In to 4In better than 0,1% of the measurement $\pm 1\text{mA}$ <0,1% of full scale
Burden In	< 0.02 VA	< 0.05 VA	< 0.02VA
Continuous overload (rms)	4 A ($4 \times I_n$)	20 A ($4 \times I_n$)	10 A
AC current thermal withstand (1th rms for 1s)	40 A ($40 \times I_n$)	200 A ($40 \times I_n$)	20 A
Input isolation	> 3.5 kV	> 3.5 kV	> 3.5 kV

Analog acquisition

SYSTEM FREQUENCY	POINTS PER CYCLE	ACQUISITION FREQUENCY	BANDWIDTH
50Hz	256 ppc	12800Hz	DC to 3150Hz
60Hz	256 ppc	15360Hz	DC to 3780Hz
50Hz	512 ppc	25600Hz	DC to 10000Hz
60Hz	512 ppc	30720Hz	DC to 10000Hz

Type Test

EMC TESTS WERE PERFORMED ACCORDING TO IEC 60255-26 REFERRING TO THE FOLLOWING		
Electrostatic discharge	IEC 61000-4-2:2008	6kV contact / 8kV air (level 3)
RF immunity	IEC 61000-4-3:2006	10 V/m (level 3)
Fast transient disturbance	IEC 61000-4-4:2012	Zone A - 4kV @ 5kHz
Surge immunity	IEC 61000-4-5:2005	Zone A Differential mode: 4kV Common mode: 2kV
Conducted RF immunity	IEC 61000-4-6:2008	10 V/m (level 3) 0.15 MHz to 80 MHz
Power magnetic immunity	IEC 61000-4-8:2009	30A/m continuous - 300A/m @ 1s (level 4)
Voltage dip, short interruptions and voltage variation immunity tests	IEC 61000-4-11:2004	AC dips (residual%) 0% - 1/1 cycles (50/60Hz) 40% - 10/12 cycles (50/60Hz) 70% - 25/30 cycles (50/60Hz) AC interrupt (residual%) 0% - 250/300 cycles (50/60Hz)
	IEC 61000-4-29:2000	DC dips (residual%) 0% - 10ms 40% - 200ms 70% - 500ms DC interrupt (residual%) 0% - 5s
Power Frequency	IEC 61000-4-16:1998	Zone A Differential mode: 150Vrms Common mode: 300Vrms
Voltage ripple	IEC 61000-4-17:1999	Test level: 15 % of rated dc. value Test frequency: 100/120Hz, sinusoidal waveform
Damped oscillatory wave immunity test	IEC 61000-4-18:2006	Voltage oscillation frequency: 1MHz Differential mode: 1kV peak voltage Common mode: 2,5kV peak voltage
Gradual Startup	IEC 60255-26:2013	Shut-down ramp: 60s Power off: 5min. Start-up ramp: 60s
Radio-frequency disturbance	CISPR11:2009 (below 1GHz)	Radiated emission below 1GHz - class A 30 MHz to 230 MHz 40 dB(μV/m) quasi peak at 10 m 50dB (μV/m) quasi peak at 3m 230 MHz to 1 000 MHz 47 dB(μV/m) quasi peak at 10 m 57dB (μV/m) quasi peak at 3m
Radiated emission	CISPR22:2008 (above 1GHz)	1 to 3 GHz - 56dB(μV/m) Average; 76dB (μV/m) peak at 3m 3 to 6 GHz - 60dB(μV/m) Average; 80dB (μV/m) peak at 3m
Conducted emission	CISPR22:2008	0.15MHz to 0,50MHz; 79dB(μV) quasi peak; 66dB(μV) average 0.5MHz to 30MHz; 73dB(μV) quasi peak; 60dB(μV) average
SAFETY TESTS		
IEC 60255-27:2013	Impulse – 5kV Dielectric withstand – 2.2 kVrms Insulation resistance > 100MΩ @ 500 Vdc	

ENVIRONMENTAL TESTS	
IEC 60068-2-1	-40°C, 16 hours (Cold operational)
IEC 60068-2-1	-40°C, 16 hours (Cold storage)
IEC 60068-2-2	+85°C, 16 hours (Dry heat)
IEC 60068-2-2	+85°C, 16 hours (Dry heat operational)
IEC 60068-2-2	+85°C, 16 hours (Dry heat storage)
IEC 60068-2-30	+25°C ± 3°C – 95% ±3% RH +55°C ± 2°C – 93% ±3% RH 6 of 24 hours (12h + 12h) cycles
IEC 60068-2-14	-40°C to 55°C / 9 hours / 2 cycles (Change of temperature)
IEC 60068-2-78	+40°C ±2°C –93% ±3% RH –10 days (Damp heat)
IEC 60255-21-1	Vibration Response and Endurance Class 2
IEC 60255-21-2	Shock Response and Endurance Class 1
IEC 60255-21-2	Bump Class 1
IEC 60255-21-3	Seismic Class 2

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