TMEiC
We drive industry

TMdrive-DCe2

Product Application Guide

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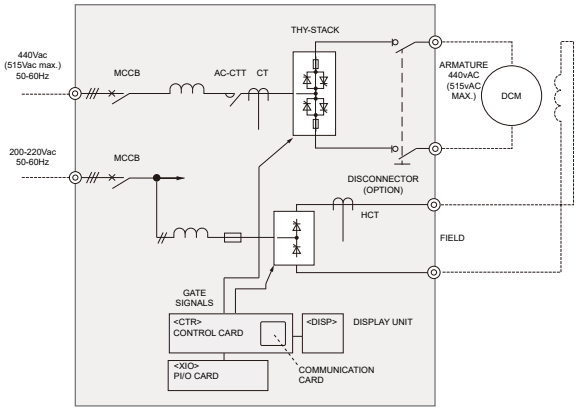
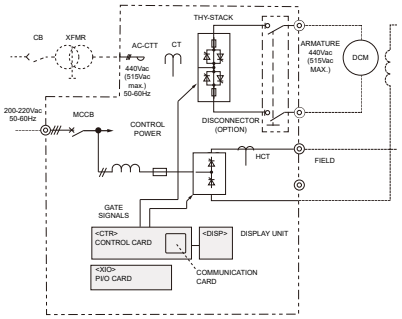
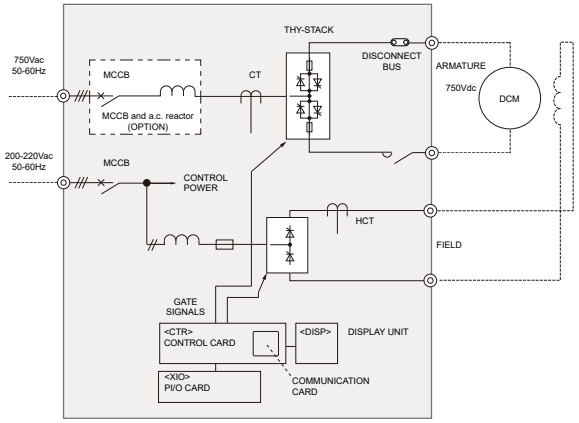
JAPAN | NORTH AMERICA | SOUTH AMERICA | EUROPE | SOUTHEAST ASIA | INDIA | CHINA | MIDDLE EAST | AUSTRALIA

A Wide Variety of Frames and Form Factors

Voltage Class	Frame Size	Output	Rating Current (OL-s)				Heat Loss	Weight	Fig	Circuit Diagram
		KW	OL%	10s	30s	60s	kW	Kg	#	
410Vdc (515Vdc max)	TML-A10	32	150	80	80	80	0.95	350	1	
		29	200	73	73	73				
		26	250	66	66	66				
		23	300	58	58	58				
	TML-A20	96	150	240	240	240	2.4	350	1	
		80	200	225	205	165				
		66	250	190	170	165				
		56	300	160	145	140				
	TML-A30	240	150	600	600	600	5.75	450	2	
		184	200	550	490	460				
		148	250	460	410	370				
		128	300	320	320	320				
	TML-A40	288	150	720	720	720	7.6	650	3	
		264	200	660	660	660				
		240	250	600	600	600				
		208	300	520	520	520				
	TML-A50	480	150	1200	1200	1200	11.2	650	3	
		420	200	1100	1100	1050				
		344	250	1000	950	860				
		292	300	870	800	730				
	TML-A60	576	150	1440	1440	1440	14.4	1200	4	
		528	200	1320	1320	1320				
		480	250	1200	1200	1200				
		420	300	1050	1050	1050				
	TML-A70	960	150	2400	2400	2400	24	1200	4A	
		776	200	2300	2220	1940				
		648	250	2020	1770	1620				
		552	300	1790	1530	1380				
750Vdc	TML-B10	900	150	1200		1200	9	750	5	
		698	200	1105		930				
		570	250	940		760				
		488	300	820		650				
	TML-B20	1080	150	1440		1440	11.7	1200	6	
		990	200	1320		1320				
		900	250	1200		1200				
		795	300	1060		1060				
	TML-B30	1800	150	2400		2400	16.3	1200	6	
		1530	200	2400		2040				
		1275	250	2300		1700				
		1087	300	2060		1450				





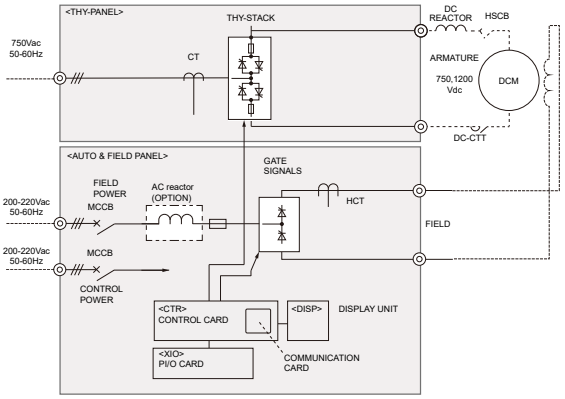
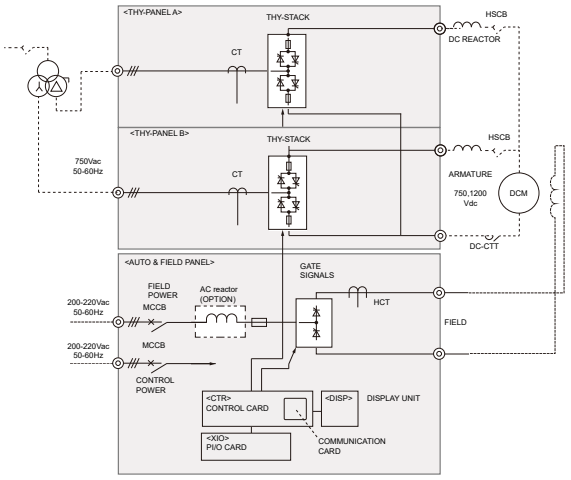


Notes TML-Ax0:

1. An incoming panel is required to a line-up with multiple drives.
2. Armature disconnect switch is offered as option
3. Frames TML-A60 and A70 do not have a Circuit Breaker in the panel. They also require an external line reactor.
4. Panels require front access only

Notes TML-Bx0:

1. MCCB and AC Line Reactor are provided as an option.
2. DC contactor closes the main circuit when UV signal is on.
3. Armature disconnect switch is offered as an option.
4. Panels require front access only.

Voltage Class	Frame Size	Output	Rating Current (OL-s)				Heat Loss	Weight	Fig	Circuit Diagram
		KW	OL%	10s	60s	120s	kW	Kg	#	
750Vdc	TML-B110	1853	175		2470		12	1360	7	
		1481	225		1975					
	TML-B120	3533	175		4710		27	2200	8	
		2828	225		3770					
	TML-B130	5062	175		6750		34	2960	9	
		4050	225		5400					
	TML-B140	6750	175		6750		41	3800	10	
		5400	225		5400					
1200Vdc	TML-C110	2346	175		1955		10	1360	7	
		1872	225		1560					
	TML-C120	4470	175		3725		21	2200	8	
		3564	225		2970					
	TML-C130	3696	175		5330		28	2960	9	
		5112	225		4260					
	TML-C140	8532	175		7110		38	3800	10	
		6816	225		5680					
750Vdc	TML-B210	3705	175		4940		23	2720	9	
		2963	225		3950					
	TML-B220	7065	175		9420		54	3800	10	
		5655	225		7540					
	TML-B230	10125	175		13500		67	5920	11	
		8100	225		10800					
	TML-B240	13500	175		18000		81	7000	12	
		10800	225		14400					
1200Vdc	TML-C210	4692	175		3910		20	2720	9	
		3744	225		3120					
	TML-C220	8940	175		7450		43	3800	10	
		7128	225		5940					
	TML-C230	12792	175		10660		60	5920	11	
		10224	225		8520					
	TML-C240	17064	175		14220		76	7000	12	
		13632	225		11360					

Notes TML-Bxx0 and Cxx0:

1. Panels require front and rear access.
2. Dimensions shown in referenced figures do not include the Automation and Field Exciter panels: 2000 mm W x 650 mm D x 2300 mm H.
3. Bridges are equipped with Heat Pipe cooling system.
4. TML-B2x0 and C2x0 are 12-pulse converters.
5. Field exciter can be provided with line reactor as option.

Mechanical Characteristics		
	Standard design	Option
Standards	JIS, JEC, JEM	IEC, CE Mark
Altitude	Less than 1000 m	Above 1000 m current derate: -1%/200 m up to 5000 m Above 4000 m voltage derate -2.5%/200 m up to 5000 m
Ambient Temperature	0° to 40° C	Above 40° C, derate -2.5%/°C up to 50°C
Humidity	5% to 85% non-condensing	
Paint color	5Y7/1	
Enclosure	IP20	IP21
Handle	Key and padlock	

Specifications

Figure 1

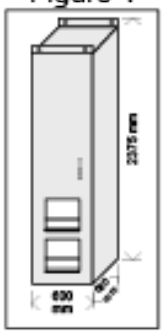


Figure 2

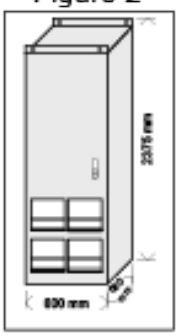


Figure 3

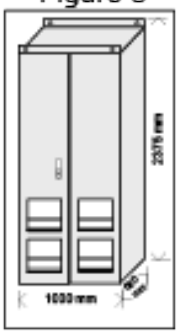


Figure 4

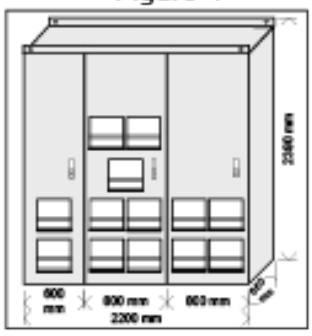


Figure 4A

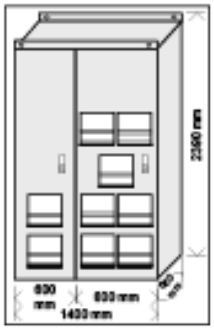


Figure 5

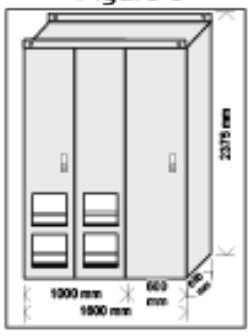


Figure 6

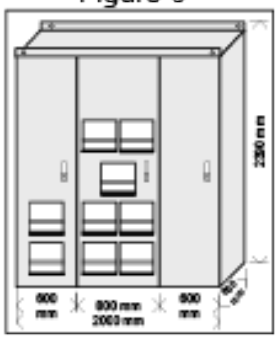


Figure 7

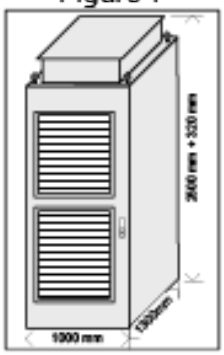


Figure 8

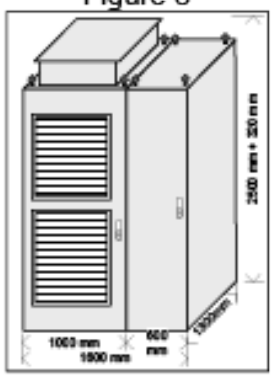


Figure 10

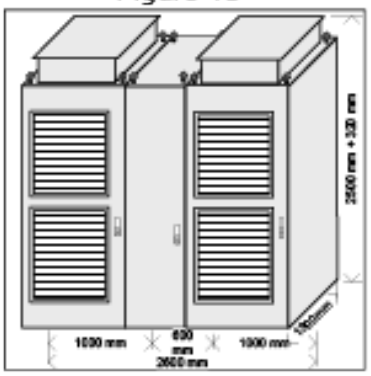


Figure 9

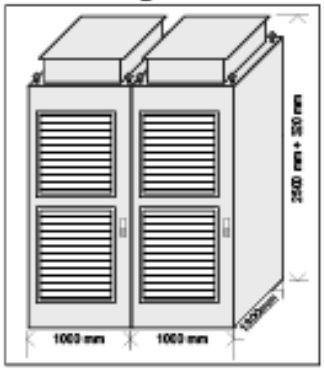


Figure 11

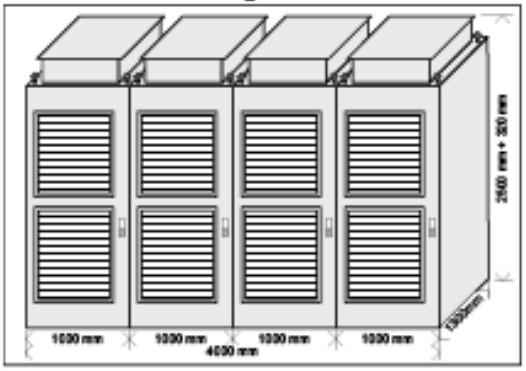
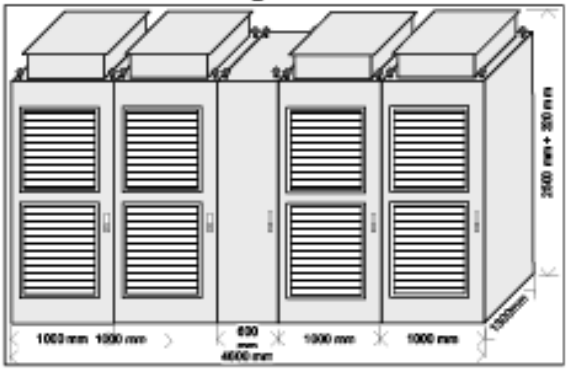


Figure 12



Electrical Characteristics		
	Standard design	Option
Frequency	50 / 60 Hz ±2Hz	
Main circuit	Copper (no plating)	Copper tin plated
Control power	3 Ph 200 V 50 Hz, 220/230 V 60 Hz ±10%	
Speed reg. accuracy	±0.01% with sensor	±0.1% with analog input, ±1% with Voltage control
Field weakening range	1.5 with sensor only	
Speed control range	0.5% to 100% with sensor	5% to 100% Voltage control
Speed reg. response	30 rad/s max.	
Current reg. response	500 rad/s max.	
Current control accuracy	±0.5%	
PLG input max. freq.	100 kHz	
Field exciter	Single phase 40 Adc. 160 Vdc	Single phase 220 Vdc. Three phase also available, see page 8.

Application Example

When specifying a DC drive, start from the process requirements and work through the motor to the converter. The following example illustrates this process.

1 Define process requirements.

kW_{Shaft} = 150 kW *(201 hp)*

The motor delivers constant torque from zero to base speed of 900 rpm and 150 kW .

Duty cycle requires 150% for 10 sec, but has an rms duty cycle of 150 kW .

2 Select motor based on process requirements and compute required power.

- 150 kW
- 900 rpm, 440 V
- Efficiency = 0.93
- Service factor = 1.25

$$I_{cnv} = \frac{kW_{Shaft} \bullet 1000 \bullet SF_{Mtr}}{Eff_{Mtr} \bullet V_{Mtr}}$$

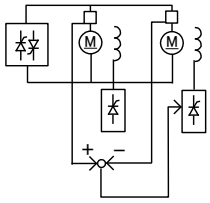
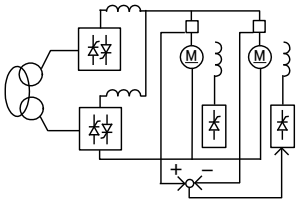
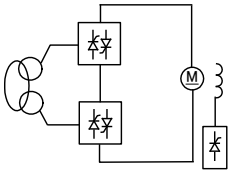
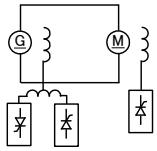
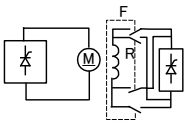
$$I_{cnv} = \frac{150kW \bullet 1000 \bullet 1.25}{0.93 \bullet 440V} = 458A$$

3 Compute continuous current requirements for the converter based on the selected motor.

4 Select converter based on continuous current and overload requirements.

Scan the 150% entries in the 440V converter tables for a frame where the continuous current rating exceeds 458 A. The **TML-A30 frame** meets this criterion (**600 A**) and is appropriate for this application.

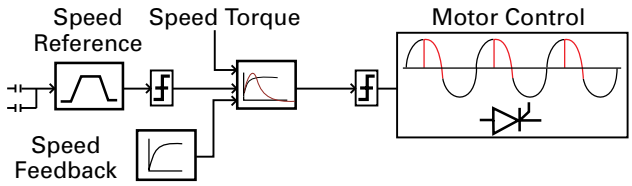
Voltage Class	Frame Size	Output	Rating Current (OL - s)			
		kW	OL %	10s	30s	60s
440 Vdc (515Vdc max.)	TML-A30	240	150	600	600	600
		184	200	550	490	460
		148	250	460	410	370
		128	300	320	320	320

Typical Configuration				
Converter configuration	**# of motors**	**Sample applications**	**Main circuit diagram**	**Remarks**
Six pulses - anti-parallel	1, 2 to 4	Cranes, Paper Machines, Metal Processing Lines		–
12 pulses - anti-parallel	1, 2 to 4	Rolling mill main drives		–
12 pulses - anti-parallel	1	Rolling mill main drives, mining hoists		12 pulses and sequential asymmetrical gate control
Motor & generator set	1 to 2 gens. 1 to 2 motors	Rolling mill drives, metal processing lines, cranes		–
Field circuit changeover	1	Metal processing lines, paper machines		–

Specifications

Control Functions

Feedback and Status | I/O Mapping | Capture Buffer | Sequencing



LAN Interface Options

- TC-net I/O
- Ethernet GlobalData (EGD)
- Profibus-DP
- ModbusRTU
- Modbus-TCP
- CC-Link
- DeviceNet
- ControlNet
- MELPLAC
- Profinet
- Ethernet/IP

TOSLINE-S20 and ISBus legacy LANs can also be supported on request.

Instrumentation Interface

Standard Display		• The digital display alternates between speed, current, and fault code in the event of an error • RJ-45 Ethernet port for local/remote toolbox connection • Ready, Run, and Alarm/Fault LEDs • Interlock button disables drive
Optional Graphic Keypad		• Four configurable variable bar graphs with descriptive legends • Status icons reflecting health of drive at a glance • Dedicated drive control keys for manual operation of the drive • Full access to all parameters and variables
Config-uration		• RJ-45 Ethernet interface • 10 Mbps maximum • TMdrive-Navigator
Motor		• Motor current A and B, ±10 V • Quantity 5 configurable, ±10 V, 8-bit resolution

Diagnostic and Protective Functions

Simulation mode for testing and training:
- Motor simulator
- Load Simulator

High-speed data capture buffer:
- Configurable trigger data capture (8 channels)
- Fault data capture (90 channels, 7-fault history, total 1MB of data)

Protection:
- Over speed
- Cooling fan failure
- Stall
- Speed error
- Timed overcurrent
- Motor overheat

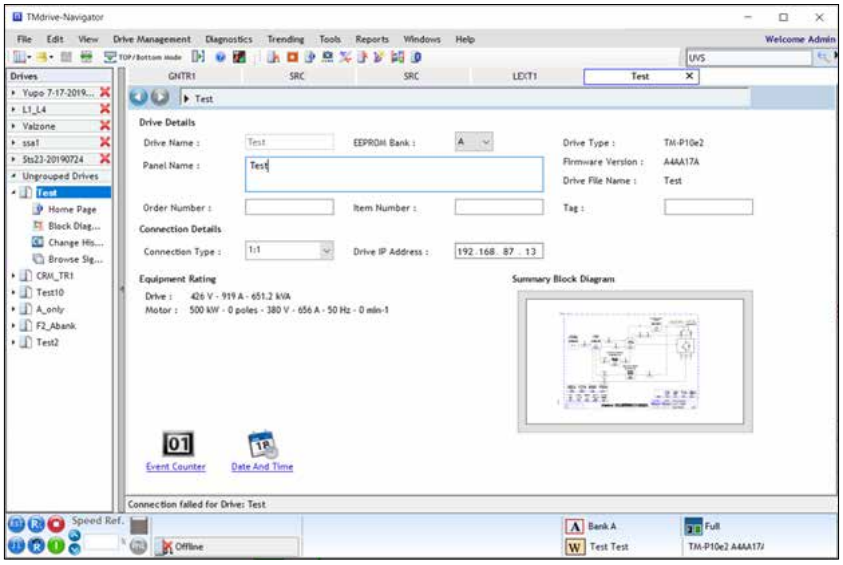
Configurable sequential functions:
- Start
- Stop
- Alarm
- Trip, etc.

I/O Interface

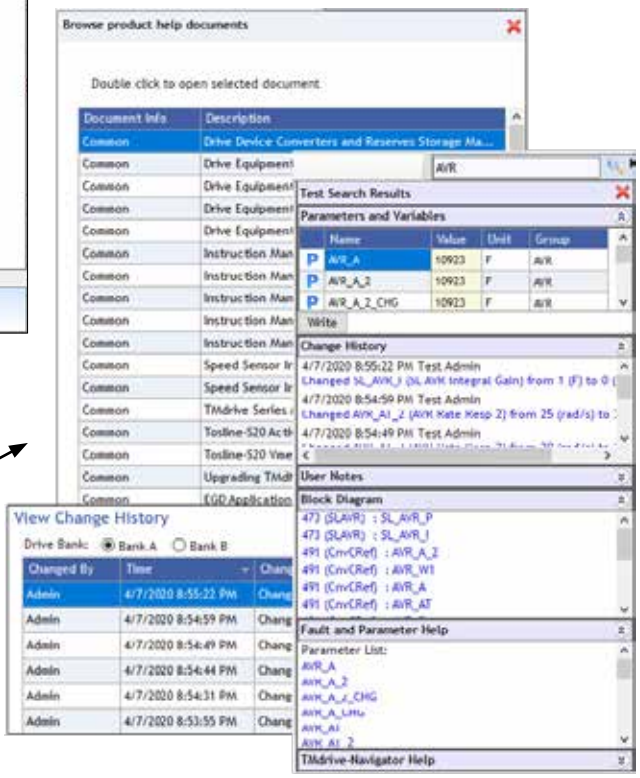
Digital Inputs	• UVS (dedicated): 1 channel • Additional 10 configurable channels • 24 Vdc ±10%, Input current about 10mA at 24Vdc • Either internal or external power supply selectable with a switch on the I/O board
Digital Outputs	• 10 configurable channels • 5-24 Vdc 110% +20% external power supply • 24Vdc Internal power supply • Up to 50 mA
Analog Inputs	• 3 channels • ±10 V or 4-20 mA • 8 kOhm • 3 bits (real 12 bits) • Differential type only • No external isolator required
Analog Outputs	• 3 channels ±10 V up to 1mA • 10 bits differential type • No external isolator required
(Optional) Speed Feedback Resolver Input	• Excitation frequency 1 kHz or 4 kHz • Type 1X, 4X • 4X up to 300 rpm
Speed Feedback Encoder Input	• Max. frequency 100kHz, different type • Max. frequency 10kHz, single-end type • 5 Vdc/15Vdc power supply • Differential or single-end inputs: 5-15Vdc
Speed Tach Follower Output	• A, B, Z • Max. freq. 100 kHz (totem-pole output) • 12-24 Vdc (-10%, +20%) • Up to 25 mA

TMdrive-Navigator

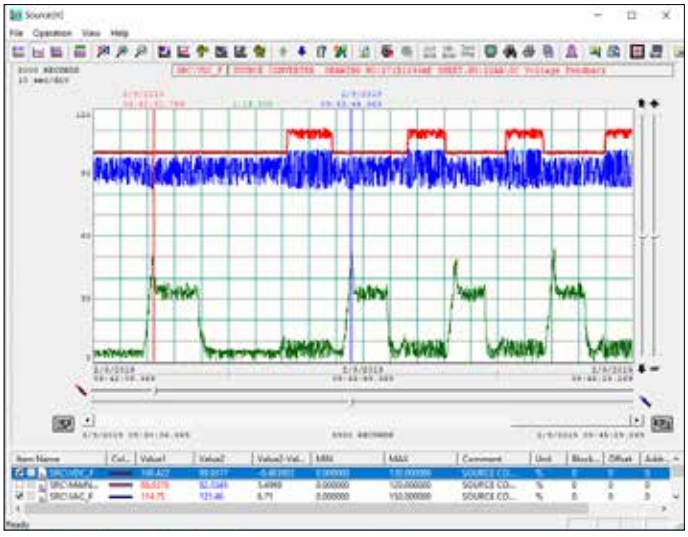
TMdrive-DCe2



The TMdrive-Navigator tool helps you maintain TMEIC drives yourself. Engineers and technicians are empowered to understand how the drive works and what the drive is doing. Any user can easily access current drive expertise and know-how.



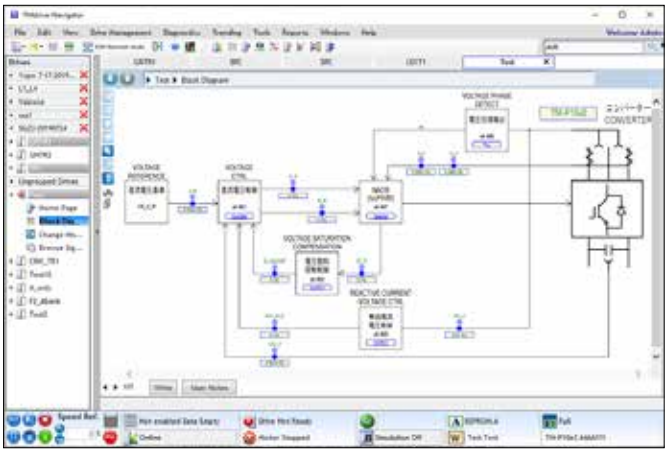
Desktop-like search technology links topical signal lists, block diagrams, help files, product documentation, change history, and user notes. Windows techniques facilitate navigation within a drive and across the system. The status of all drives is always in view.



High speed data is automatically captured and saved in the event of a drive fault. Users can also capture high speed data based on their own trigger conditions or perform high resolution real-time trending.

Fault data can be automatically "pushed" to key users. The client-server architecture allows access to high performance data from remote locations – with the same resolution as if you were in the plant.

Wizards support tuning of drive functions.



Live block diagrams provide a real-time graphical view of drive functions. Functions can be configured directly from the graphical view.

Product documentation is integrated right into the tool. Users can even capture their own notes to benefit future troubleshooting.

Compatible with:

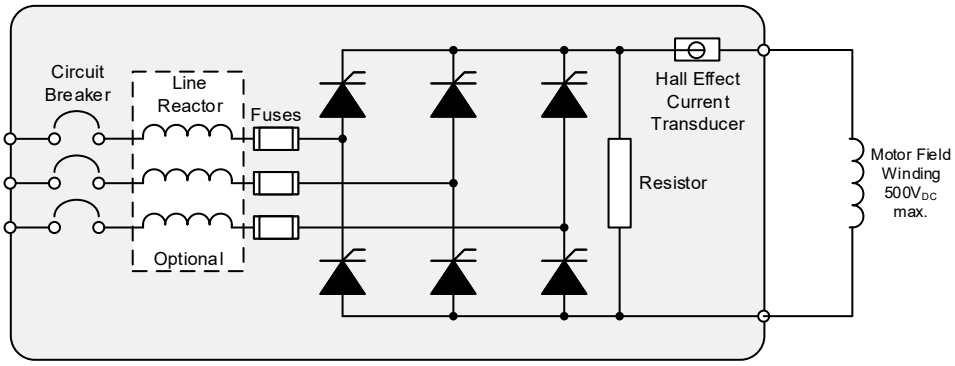
- Windows 7 (32-bit, 64-bit)
- Windows 10 (64-bit)
- Windows Server 2012
- Windows Sever 2016

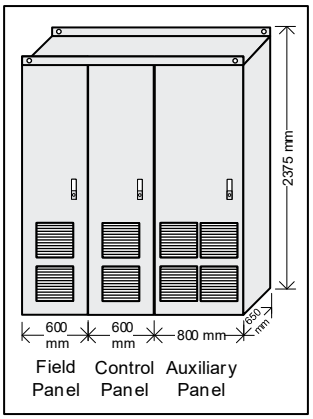
Main Motor Class Converters Automatic Panel and Field Panel

A Main Motor Class Converter, such as the TML-B1x0, TML-B2x0 and TML-C2x0, includes separated Control and Field Exciter Circuits. The Field Exciter is a three phase, 6-pulse thyristor rectifier. The Field Panel can also be combined with TML-Bx0 converters.

The width of the Auxiliary panel varies depending on the application.

Frame	DC Voltage	DC Current
	V_{DC}	A_{DC}
200	440	240
400	440	480





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