For special applications the performance of the drive system can be further extended by additional modules (additional bleeder, TBM, additional capacitors, CZ or TCM). Further details of these can be obtained from the documentation covering the power supply modules.

The specific characteristics of the various servo drive modules and supply modules are summarized in the following table:

Servo drive module	Characteristics
TDM 1	Standard servo drive module for MAC 71 to MAC 160 motors
TDM 2	Obsolescent special unit for MAC 63 to MAC 93 motors
TDM 3	Standard servo drive module for MAC 63 to MAC 112B motors
TDM 4	Servo drive module for MAC 21, MAC 25, MAC 41 motors (feedback electronics built into drive module instead of motor
TDM 6	Servo drive module for low-noise applications and with interface for temperature monitor, brake and starting interlock for MAC 63 to MAC 93 motors
TDM 7	Servo drive module for low-noise applications and with interface for temperature monitor, brake and starting interlock for MAC 21, MAC 25, MAC 41 motors (feedback electronics built into drive module instead of motor)
KDS 1	Servo drive module using cold-running technology for MAC 90 to MAC 160 motors (due to built-on external heat exchanger no heat losses occur in the control cabinet).

Fig. 3: Summary of the various servo drive modules

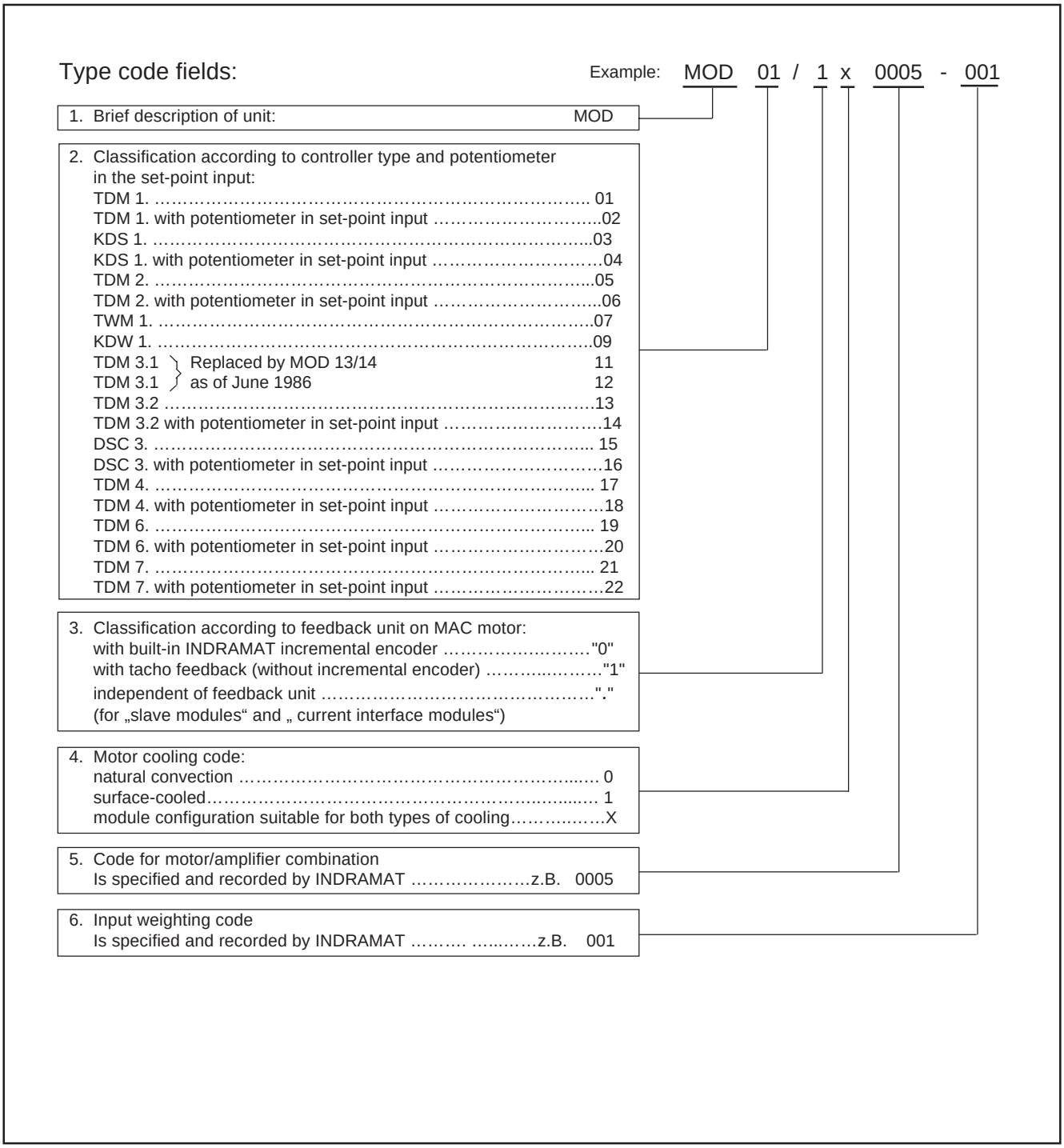


Fig. 18: Type designation of MOD programming module

Example of MOD 13
programming module labelling

INDRAMAT	MOD 13/1X012-002
Contr.: TDM 3.2-020-300-W0	
Motor: MAC 090A-.-ZD-.-C	
Current (A): peak/cont.: 20/15	
Operating rpm: 2000	MA: 0,375 V/A
Input rpm/V:	E1/E2: 2000/10
E3: 3000/10	E4:

1500/10

OPERATING PARAMETER-PROGRAMMING MODULE
ATTENTION: MOTOR AND CONTROLLER-TYPE INDICATED ON THE MODULE MUST AGREE WITH THE DEVICES IN USE. OTHERWISE LACK OF PERFORMANCE AND DANGER OF DAMAGE.

Betriebsdaten-Programmierungsmodul

Achtung: Motor- und Verstärkertypenangaben müssen mit der Installation übereinstimmen, sonst Schädigungsgefahr

Example of MOD 14
programming module labelling

INDRAMAT	MOD 14/1X012-016
Contr.: TDM 3.2-020-300-W0	
Motor: MAC 090A-.-ZD-.-C	
Current (A): peak/cont.: 20/15	
Operating rpm: 2000	MA: 0,375 V/A
Input rpm/V:	E1/E2: 2000/10
E3: 3000/10	E4: 1500/10

OPERATING PARAMETER-PROGRAMMING MODULE
ATTENTION: MOTOR AND CONTROLLER-TYPE INDICATED ON THE MODULE MUST AGREE WITH THE DEVICES IN USE. OTHERWISE LACK OF PERFORMANCE AND DANGER OF DAMAGE.

Betriebsdaten-Programmierungsmodul

Achtung: Motor- und Verstärkertypenangaben müssen mit der Installation übereinstimmen, sonst Schädigungsgefahr

P1 (E1/E2) P2 (E3) P3 (E4)

MOD 13 and MOD 14 programming module board layouts

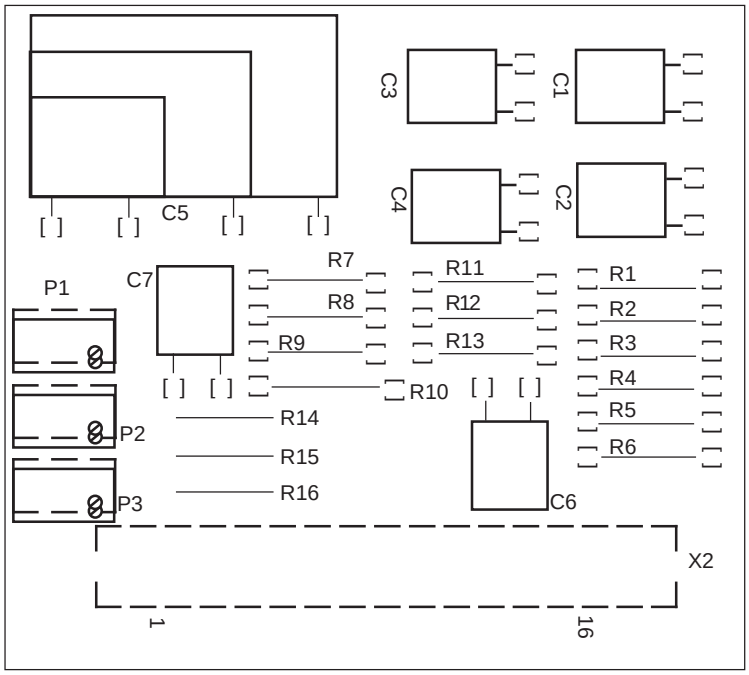


Fig. 25: Module labels: MOD 13, MOD 14 for TDM 3 drive module MOD 19, MOD 20 for TDM 6

5. Connections and Installation

5.1. Protection of Personnel and Equipment



The guidelines as listed in Chapter 6.1 on protection of personnel, equipment and machinery when connecting, assembling and testing the drives must be followed.

5.2. Assembly

5.2.1. Preferred arrangement of modular units within the control cabinet

Both the servo drive module and its supply module are flush mounting equipment, as outlined in DIN VDE 0160, Sections 5.5.1.3 and 6.5.1.3. This means that they are intended for mounting in a control cabinet. IP 10 is their protection category.

The control cabinet housing should, in accordance with those safety guidelines valid for this application, guarantee sufficient protection against hazards in areas where the general public has access. (For industrial applications, e.g, see EN 60204/DIN VDE 0113, Section 1.) Only properly trained personnel with proper tools or keys should have access to the interior of the control cabinet.

The modular units should, if possible, be arranged as depicted in Figure 34. The drives with high power and voltages should be located as close as possible to the supply unit.

If the ventilated servo drive modules TDM3 and TDM 4 (type designation TDM 3.2-030-300-**W1**, or TDM 4.1-030-300-**W1**) or TDM 6 and TDM 7 (type designation TDM 6.1-025-300-**W1**, or TDM 7.1-025-300-**W1**)

– are arranged on the left side of the drive packet, or,

– are mounted on the left side at a distance greater than 10 mm from an adjacent module,

then a cooling baffle (INDRAMAT mat. no. 224 869) must be screwed onto the heatsink on the left side of the unit. (Also see the dimensions sheet for the servo-drive module.) Only this arrangement guarantees that the fan will provide sufficient cooling.

The end plug, found in the accessories set of the supply module, is plugged into contact strip X1 located in the unit farthest away from the supply module.

It monitors the line connection X1.

It is also possible to arrange the drive module with supply modules on the right and line up the drive modules on the left.

5.2.5. Dimensions sheet and mounting dimensions for servo drive modules

The following figures list mounting dimensions and outline the mounting of the servo drive modules:

Overview of Dimensions Data

Dimension sheet:	Figure:
Dimension sheet TDM 1, TDM 2	Fig. 42
Mounting dimensions TDM 1, TDM 2	Fig. 43
Dimension sheet TDM 3, TDM 4,	Fig. 44
Dimension sheet TDM 6, TDM 7	Fig. 45
Dimensions for fan attached to modular units TDM 3, TDM 4, TDM 6, TDM 7	Fig. 46
Mounting dimensions TDM 3, TDM 4, TDM 6, TDM 7	Fig. 47
Assembly TDM 1, TDM 2, TDM 3, TDM 4, TDM 6, TDM 7	Fig. 48
Dimension sheet KDS 1	Fig. 49
Dimensions for available space and arrangement KDS 1	Fig. 50
Mounting dimensions KDS 1	Fig. 51
Assembly KDS 1	Fig. 52

The minimum clearance to adjacent units must be absolutely maintained to guarantee sufficient heat transmission and circulation.

The temperature within the mounting area (interior) of the control cabinet should not exceed 45°C. Forced ventilation, to avoid dammed up heat, as well as a reduction in the max. unit current, by 2.5% / K., become necessary with higher values, up to max. 55°C.

If a cing device is used, then the internal temperature of the control cabinet must be maintained at a minimum of 2 degrees Celsius above external temperatures to prevent bedewing. Bedewing of a printed circuit board can cause drive failure.

Heat-producing built-in parts should not be installed directly underneath the servo drive module.

Diagnostic Displays Servo Drive Modules TDM 3 and TDM 6

Equipment with serial numbers from SN 240 060 - XXXXX are equipped with expanded diagnostics.

Note: The messages are only then valid if "+24V, plus/minus15V" message displays constant green light.

(1) Message and unit lock are being stored.
Re-set by hitting re-set key or switching back on.

Light-emitting diode		Off	Flashing	Cont. Light
+24V, ±15V green		Switched off because there was no controller voltage or it was temporarily disrupted **(1)**	———	Controller voltage **working**
BLC 1 green	Rotor position	**Working:** Motor standing still: One or two light-emitting diodes out **Malfunction:** BLC 1, BLC 2, BLC 3 are simultaneously out. Faulty connection or fault in feedback cable.	**Working:** Each "BLC" LED flashes at low speed. ($n < 100\ min^{-1}$) The flashing appears to be a constant light at higher speeds.	**Working:** Motor standing still: One or two LEDs lit up. **Malfunction:** BLC 1, BLC 2, BLC 3 simultaneously lit up with low speeds or stand still. Faulty connection or fault in feedback cable.
BLC 2 green				
BLC 3 green				
Tacho green		Disconnected due to tachometer or BLC malfunction, faulty connection or break in cable of the feedback cable or motor overspeed (1)	———	Tacho and BLC **Working**
PWR (Power) green		Power voltage not switched on or discrupted.	———	Power voltage present **Working**
RF green		No controller enable signal at terminal RF	Controller enable applied, but unit internally locked because no power voltage and/or malfunction present	Controller enable applied, Drive active **Working**
Bb green		Unit locked because fault present (display via different LED)	Drive problem free, no power voltage	Drive ready-to-operate **Working**
TS red		Temperature within acceptable range **Working**	Equipment temperature too high. Drive will shut down in 30 seconds.	Shutdown due to excessive equipment temperature **(1)**
BS red		Current within acceptable range **Working**	———	Shutdown due to overcurrent, short-circuit or ground leak in amplifier, cable or motor **(1)**

DiagTDM3neu/6

Figure 85: Diagnostics Display Servo Drive Module TDM3 with Serial Numbers from SN 240060-... and TDM6

Diagnostic Displays Servo Drive Modules TDM 3

Equipment with serial numbers from SN 240 060-XXXXX

Note: The messages are only then valid if "+24V, plus/minus15V" message displays constant green light.

(1) Message and unit lock are being stored.
Re-set by hitting re-set key or switching back on.

Light-emitting diode		Off	Flashing	Cont. Light
+24V, ±15V green		Switched off as no controller voltage	—	Controller voltage **working**
BLC 1 green	Rotor position	**Working:** Motor standing still: One or two light-emitting diodes out. **Malfunction:** BLC 1, BLC 2, BLC 3 are simultaneously out. Faulty connection or fault in feedback cable.	**Working:** Each "BLC" LED flashes at low speed ($n < 100\ min^{-1}$) The flashing appears to be a constant light at higher speeds.	**Working:** Motor standing still: One or two LEDs lit up. **Malfunction:** BLC 1, BLC 2, BLC 3 simultaneously lit up with low speeds or stand still. Faulty connection or fault in feedback cable.
BLC 2 green				
BLC 3 green				
Tacho green		Disconnected due to tachometer or BLC malfunction, faulty connection or break in cable of the feedback cable or motor overspeed **(1)**	—	Tachometer and BLC **Working**
POWER green		Power voltage not switched on or disrupted.	—	Power voltage present **Working**
RF green		No controller enabler signal at terminal RF.	—	Controller enabler applied Drive active **Working**
Bb green		Unit locked because fault present (display via different LED).	—	Drive ready to operate **Working**
BS red		Current within acceptable range **Working**	—	Shutdown due to overcurrent or short-circuit in amplifier, cable or motor **(1)**
TÜ red		Temperature within acceptable range **Working**	—	Equipment temperature too high. Drive to shutdown in 30 seconds.
TS red		**Working**	—	Shutdown due to excessive equipment temperature **(1)**

DiagTDM3alt

Figure 86: Diagnostics Display Servo Drive Module TDM3 with Serial Numbers below SN 240060-...

10.2. Important Data on the Servo Drive Module

Servo drive module for unit type	Current set-point Terminal MA	Current actual value Terminal lactual,	Minumum adjustable current Ired	Corresponding Programming Module MOD Without setpoint potentiometer compensation	With set-point potentiometer compensation
	kMA	list	Imin		
	V/ A	V/ A	A		
TDM 1.2-030-300	0.050	-	15	MOD 1	MOD 2
TDM 1.2-050-300	0.050		15	"	"
TDM 1.2-100-300	0.050	-	15	"	"
TDM 1.2-030-300/ SO 100	0.250	-	3	"	"
TDM 1.2-050-300/ SO 100	0.150	-	5	"	"
TDM 1.2-100-300/ SO 100	0.075	-	10	"	"
TDM 2.1-015-300	0.075	-	1.5	MOD 5	MOD 6
TDM 2.1-030-300	0.250	-	3	"	"
TDM 3.2-020-300	0.375	0.375	1	MOD 13	MOD 14
TDM 3.2-030-300	0.250	0.250	1.3	"	"
TDM 4.1-020-300	0.375	0.375	1	MOD 17	MOD 18
TDM 4.1-030-300	0.250	0.250	1.3	"	"
TDM 6.1-015-300	0.500	0.500	1	MOD 19	MOD 20
TDM 6.1-030-300	0.250	0.250	1.3	"	"
TDM 7.1-015-300	0.500	0.500	1	MOD 21	MOD 22
TDM 7.1-030-300	0.250	0.250	1.3	"	"
KDS 1.1-030-300	0.250	-	1.3	MOD 3	MOD 4
KDS 1.1-050-300	0.150	-	2	"	"
KDS 1.1-100-300	0.075	-	4	"	"
KDS 1.1-150-300	0.050	-	6	"	"

Figure 96: Summary of important data on the servo drive module (additional data outlined in the data sheets in Chapter 12).

Technical Data TDM 3

Designation	Symbol	Unit	TDM3.2-020-300-W0	TDM3.2-030-300-W1[1)]
Type of cooling			natural convection	forced ventilation
Power section				
Current	I(type)	(A)	20	30
Peak current	I(peak)	(A)	20	30
Continuous current	I(cont)	(A)	15	25
Link circuit d.c. voltage	U(DC)	(V)	300 (± 15%)	300 (± 15%)
Power	P(cont)	(kW)	6	9
Power loss with I(cont)	P(v)	(W)	110	175
Weight	m	(kg)	8	8
Current consumption of signal processing (without external load)				
+ 24V Load voltage	I(+UL)	(mA)	400	800[2)]
+ 15V Measuring voltage	I(+UM)	(mA)	120	125
- 15V Measuring voltage	I(-UM)	(mA)	50	55
Current capacitance of the voltages at terminal X43 for external consumption				
+ 24V Load voltage	I(+UL)	(mA)	50	
+ 15V Measuring voltage	I(+UM)	(mA)	15	
- 15V Measuring voltage	I(-UM)	(mA)	15	
Operating conditions				
permissible ambient temperature range with rated data		(°Celsius)	+5 ... +45	
maximum permissible ambient temperature with reduced rated data		(°Celsius)	55	
Storage and transport temperatures		(°Celsius)	-30 ... +85	
Mounting altitude without reduction of rated data			max. 1000m above NN	
Permissible humidity acc. to humidity classification			F in acc. with DIN 40 040	
Insulation category			C in acc. with DIN VDE 0110	
Type of protection			IP 10 acc. to DIN 40 050	

1) Servo drive module TDM 3.2-030-300-W1 can only be operated with one fan unit.

2) Current consumption equals 800 mA when the 24V direct current fan unit LE5-024 is connected to the +24V of the servo drive module. Current consumption is reduced to 650 mA, if fan units LE5-220 or LE5-115 are used.

Technical Data: fan unit for forced ventilation in TDM 3.2-030-300-W1

				Obsolete modules	
Designation	Symbol	Unit	LE5-024-..	LE5-220-..	LE-115-..
Supply voltage	U	(V)	DC24(-10%/+20%)	AC220(±10%)	AC115(±10%)
Frequency	f	(Hz)	-	50 ... 60	50 ... 60
Power consumption	P		3,6 W	20 VA	20VA
Weight	m	(kg)	1	1,17	1,17

Figure 100: Technical Data of Servo Drive Module TDM 3